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Profit Polygraph for Product Mix Evaluation

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Break-even charting is developed in this article for the construction of a chart of ready reference to the sales volumes by several product groups which make up a company profit result, with provision for reading directly the effect of varying these volumes. The procedure is intended to open up the inherent possibilities of break-even analysis in graphic form, which, in break-even charting as conventionally done, are limited as to extent to recognition of only a single critical product mix problem. An essential portion of the technique, which permits presentation of several sets of break-even data together to establish their relationship, is the condensation of such data into correlated scales of sales and profits measured along opposite sides of a vertical line.

TODAY, BUSINESS IS CONFRONTED with the problem of ascertaining through a flexible chart mechanism break-even profit points for a whole range of total sales possibilities introduced by multiple factors of fixed costs and product lines. This creates an impelling necessity for taking various sales mixes into account, and underlines the inadequacy of the conventional break-even chart. The serious shortcomings of the conventional break-even chart led to the development of the system suggested in this presentation. The conventional break-even chart considers only the case of a single product or a consistent average mix of products. When management is confronted with the necessity for determining break-even points for different products with individual fixed costs and with individual cost rates, the conventional break-even chart tends to become unserviceable whether on the basis of past performance or in the light of changes in emphasis on product.

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ILLUSTRATIVE DATA FOR THREE PRODUCT LINES

PROFIT AND LOSS ANALYSIS

Cost Elements By Product Line						Sales By Product Line			Profit and Loss By Product Line			Non-Allocable Costs		Total Profit
A		B		C										
Fixed	Variable Rate .60	Fixed	Variable Rate .65	Fixed	Variable Rate .75	A	B	C	A	B	C	Fixed	Variable Rate .08	
$25,000	$ 0	$20,000	$ 0	$15,000	$ 0	$ 0	$ 0	$ 0	$-25,000	$-20,000	$-15,000	$20,000	$ 0	($-80,000)
25,000	60,000	20,000	0	15,000	0	100,000	0	0	15,000	-20,000	-15,000	20,000	8,000	(-48,000)
25,000	60,000	20,000	115,555	15,000	0	100,000	177,777	0	15,000	42,222	-15,000	20,000	22,222	0
25,000	60,000	20,000	130,000	15,000	0	100,000	200,000	0	15,000	50,000	-15,000	20,000	24,000	6,000
25,000	60,000	20,000	130,000	15,000	44,531	100,000	200,000	59,375	15,000	50,000	- 157	20,000	26,750	16,094
25,000	0	20,000	0	15,000	0	0	0	0	-25,000	-20,000	-15,000	20,000	0	(-80,000)
25,000	0	20,000	0	15,000	150,000	0	0	200,000	-25,000	-20,000	35,000	20,000	16,000	(-48,000)
25,000	0	20,000	50,555	15,000	150,000	0	77,777	200,000	-25,000	7,222	35,000	20,000	22,222	-25,000
25,000	0	20,000	65,000	15,000	150,000	0	100,000	200,000	-25,000	15,000	35,000	20,000	24,000	-19,000
25,000	35,625	20,000	65,000	15,000	150,000	59,375	100,000	200,000	- 1,250	15,000	35,000	20,000	26,750	0

SUPPLEMENTARY PROFIT AND LOSS ANALYSIS
(Double underscoring indicates break-even volume)

Fixed Cost	Variable Cost A .60	B .65	C .75	D .08	Total Cost	Sales A	B	C	Total Sales	Total Profit
$80,000	$ 0	$ 0	$ 0	$ 0	$ 80,000.00	$ 0	$ 0	$ 0	$ 0	($80,000)
80,000	60,000	0	0	8,000.00	148,000.00	100,000	0	0	100,000.00	(48,000)
80,000	60,000	115,555.00	0	22,222.00	277,777.00	100,000	177,777.00	0	277,777.00	0
80,000	60,000	130,000.00	0	24,000.00	294,000.00	100,000	200,000.00	0	300,000.00	6,000
80,000	60,000	130,000.00	44,531.00	26,750.00	343,281.00	100,000	200,000.00	59,375	359,375.00	16,094

BREAK-EVEN WITH TOTAL SALES VOLUME OF $277,777.00

$80,000	$ 0	$ 0	$ 0	$ 0	$ 80,000.00	$ 0	$ 0	$ 0	$ 0	($80,000)
80,000	0	0	150,000.00	16,000.00	246,000.00	0	0	200,000	200,000.00	(46,000)
80,000	0	50,555.00	150,000.00	22,222.00	302,777.00	0	77,777.00	200,000	277,777.00	(25,000)
80,000	0	65,000.00	150,000.00	24,000.00	319,000.00	0	100,000.00	200,000	300,000.00	(19,000)
80,000	35,625	65,000.00	150,000.00	26,750.00	359,375.00	59,375	100,000.00	200,000	359,375.00	0

BREAK-EVEN WITH TOTAL SALES VOLUME OF $359,375.00

EXHIBIT 1

As a practical matter, there is no single break-even point for a business engaged in multiple product lines. In actuality, a whole series of break-even points can be ascertained on an overall sales volume picture, depending first upon what facilities are used to achieve it and, secondly, upon what product groups are used to create such sales volume. The method presented in the following pages takes into simultaneous consideration the numerous forces acting on business.

How Profit-Polygraph Develops from Break-Even Charting

The multiple break-even charting presentation used here, develops a chart termed a profit-polygraph. This chart emphasizes, not only the break-even aspects of the operating problem but also the net profit resulting from any combination of products and fixed costs. For persons interested in ratios, it also describes net profit percentages. It is a graphic presentation which can be expanded or contracted as the needs of the corporation vary. It can also show, by further expansion, the rate of return on investment, and the influence of the addition of more product groups, or sub-components of contributing factors

underlying each product group. The technique, in effect, is an humble cousin of analogue computers, which are based on the principle of representing quantities by physical analogy. The advantage of this particular analogue procedure over the fixed chart format lies in its ability to handle more than two quantities simultaneously.

The polygraph is built on a simplified form of the break-even chart. In order to illustrate the transition from the conventional methods of presenting the usual form of break-even chart, the following paragraphs describe the method by which conventional break-even charts can be re-adapted to profit-polygraph form. As the subject is developed, it can be understood that the polygraph is made up of a related series of individual break-even charts which, when combined into polygraph form, develop the inter-relationship of each segment of profit upon the whole. Let us for the present take an example from the Profit and Loss Analysis (upper half of Exhibit 1) of a single product line and show it in both the conventional break-even chart form and in the polygraph form. The facts given are:

B = Sales of Product Line B
$.65 = Variable cost and expense per dollar of sales of Product Line B
$20,000 = Allocable fixed costs and expenses associated with Product Line B

By the usual methods of least squares or lines of best fit, the break-even chart shown in Exhibit 2 can be developed to represent costs and profits on the vertical axis and sales dollar volume on the horizontal axis. It will be noted that, at zero sales, the loss amounts to the full fixed cost. The break-even point (zero profit) occurs at sales volume of $57,143. Beyond the point of $57,143, various profit levels can be developed as sales volume increases. In a sense, this chart is not a direct reading chart, since profits can be determined only by points of difference between the sales and cost curves.

The further simplification of the break-even chart is shown in the upper portion of Exhibit 3 in which, for any level of sales volume, it is possible to read along the profit curve the resulting profit. This latter chart is constructed by methods used in Exhibit 2, except that the axis is rotated so that total profits may be read by reference first to the sales volume line and then to the vertical axis of the chart showing profit dollars. The lower portion of Exhibit 3 shows the same factors in linear form. As will be noted, profits can be read directly alongside of the sales dollars without the need of coordinate graphs or of counting spaces for differentials between costs and sales. In effect, the profit chart is reduced to a form which can be read at a single glance.

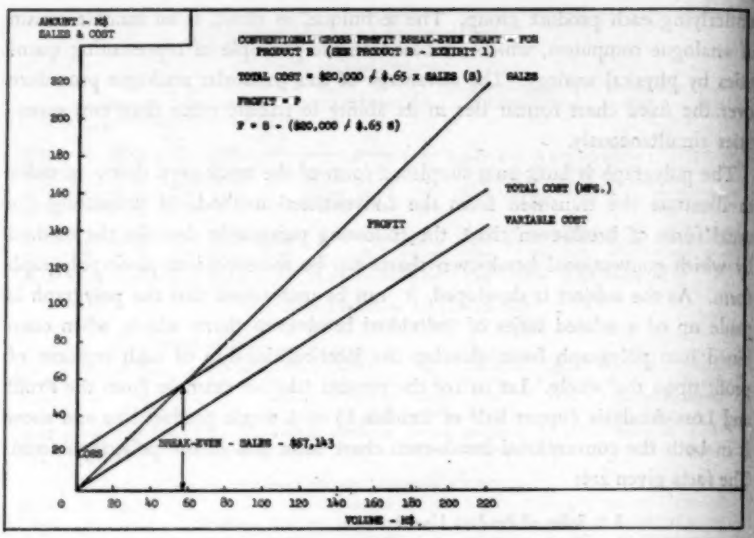


EXHIBIT 2

It is this simple linear form which is compounded to form the basis for building the profit-polygraph. It should be noted also that in this simplified form it is possible to further index the left side of the graph to show, at all levels, fixed cost as well as variable amounts. Fully indexed, the chart will make quickly available all information shown on the conventional form of break-even chart. Moreover, by a further adaptation of the polygraph, the chart can be designed to show the effects of price increases and decreases, as well as the effects of raising and lowering fixed and variable costs and expenses on profit. Exhibit 3 is shown here primarily to illustrate how each segment of the polygraph is constructed by variation of break-even charting. For a single product line, there is little to recommend the use of the linear form over the break-even form, except that the linear form can be interpreted directly without traveling vertically and horizontally over the chart.

Pre-Requisites: Product Groups, Budgetary Control

The polygraph is concerned with what happens when there is more than one product group involved. Before going further into the subject of developing the polygraph, a word should be said about grouping. The grouping of products will largely depend upon the nature of the business. It is not uncommon

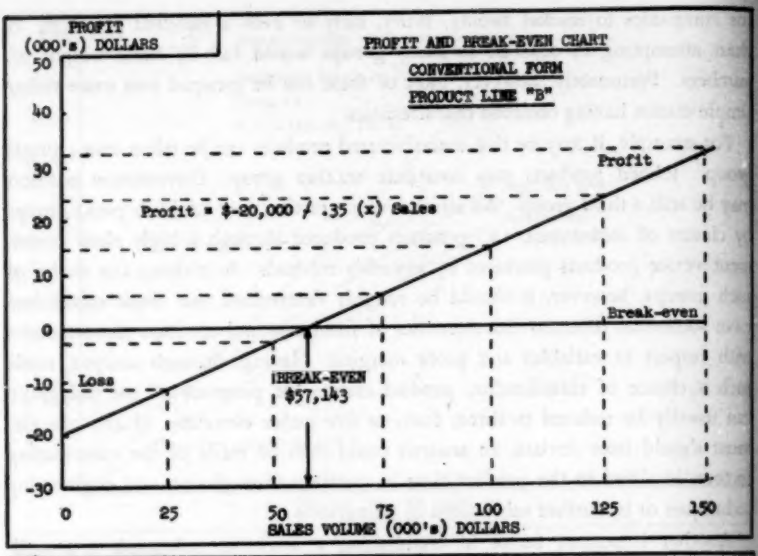
for companies to market twenty, thirty, sixty or even a hundred products. A chart attempting to describe so many groups would fall by sheer weight of numbers. Fortunately, however, most of these can be grouped into some rather simple classes having common characteristics.

For example, it may be that manufactured products can be taken into a single group. Jobbed products may constitute another group. Government business may be still a third group. An alternative suggestion is to establish profit groups by classes of investment, i.e., products produced through a high plant investment versus products produced by assembly methods. In making any choice of such groups, however, it should be roughly determined that those established have somewhat common characteristics of fixed cost and common characteristics with respect to variables and profit margins. Having, through analysis, made such a choice of classification, product classes for purposes of the polygraph can usually be reduced to three, four, or five major elements. If any one element should later deviate, an analysis could then be made of the contributing factors, localized to the product class in question through cost and engineering techniques or by further subsections of polygraphs.

Another important factor in establishing a workable polygraph is a well-founded budget program. No definitive solutions to the question of profits can be gained from any form of charting, without control of expenses as dependent variables. In other words, it is first necessary to gain control of costs before projections of profits can be made or before performance can be analyzed with respect to profit contributions.

Change in Product Mix is the Critical Consideration

To provide an illustration of the profit polygraph and its uses, let us take a firm which manufactures two classes of products. These will be called Product A and Product B at variable gross profit rates of 40 per cent and 35 per cent, respectively. In addition, the manufacturer carries a Product line C on a jobber basis grossing 25 per cent. Costs for Products A, B and C on a variable basis are, therefore, 60 per cent, 65 per cent and 75 per cent per dollar of sales, respectively. Further, assume an 8 per cent per dollar of total sales variable cost of a general administrative nature, which cannot be determined by product line and which, perforce, would be charged against total sales to arrive at a net profit. (Every attempt should be made to allocate, on a specific basis insofar as possible, manufacturing, research, engineering, administrative and sales expenses to a product class, so that each product group will contain as full a statement of fixed and variable cost applicable to it as possible). We shall also as-


PROFIT
(000's) DOLLARS
PROFIT AND BREAK-EVEN CHART
CONVENTIONAL FORM
PRODUCT LINE "B"
Profit
Profit = $-20,000 / .35 (x) Sales
Break-even
Loss
BREAK-EVEN
$57,143
50
40
30
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
SALES VOLUME (000's) DOLLARS

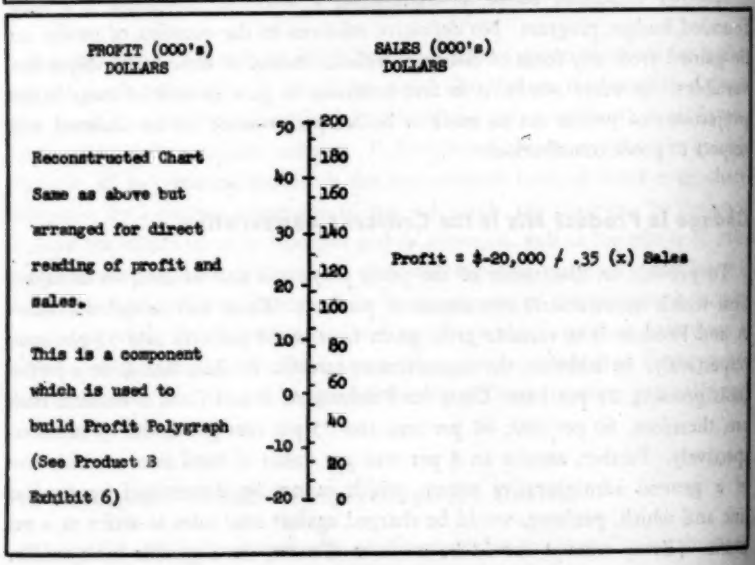

PROFIT (000's)
DOLLARS
SALES (000's)
DOLLARS
Reconstructed Chart
Same as above but
arranged for direct
reading of profit and
sales.
This is a component
which is used to
build Profit Polygraph
(See Product B
Exhibit 6)
50
40
30
20
10
0
-10
-20
200
180
160
140
120
100
80
60
40
20
0
Profit = $-20,000 / .35 (x) Sales

EXHIBIT 3

sume that fixed costs total $80,000, consisting of an allocable portion and an unallocable portion. Of the allocable portion, $25,000 is attributable to Product A, $20,000 to B, and $15,000 to C. The remaining $20,000 of fixed cost is not specifically allocable to any one class and, therefore, is charged against the overall operation of the company. These factors are shown in tabular form in Exhibit 1.

A moment's reflection will reveal that the break-even point will be determined, not only by the volume of sales but also will be influenced by the particular mix of Products A, B and C which might be sold. In the lower portion of Exhibit 1 it will be noted that a break-even point is developed on a sales volume of $277,000. For the same products and in the same firm, the lower portion also shows that the break-even point is developed at a level of total sales volume of $359,375. What, then, is the reason for this clearly established discrepancy?

It is clear that a sales mix in which the contribution of Product A is larger results in a break-even point at a lower level of total sales than one in which the contribution of Product C is proportionately greater. The fact, as mentioned above, is that there are any number of break-even points, depending upon the particular sales mix which is under consideration. It is this probable mix which is not adequately handled by usual methods but which can be understood and accounted for through the polygraph chart. The chart does not assume a fixed sales mix, nor does it limit the volume of sales to a predetermined level or an assumed proportionate contribution of each product. Under the break-even chart approach, the break-even point determined is valid only if the proportionate mix considered remains stable. To illustrate, equations have been worked out from data given in the Supplementary Profit and Loss Analysis (lower half of Exhibit 1). Exhibit 4 is a chart showing a conventional break-even chart developed from the first set of data shown in this supplementary profit and loss analysis. It should be noted that use of these data develops a fixed cost of $77,500 and a variable cost of $.73 per dollar of sales, which results in a break-even point of $285,500 of sales. However, should we use the second set of data shown in the supplementary profit and loss analysis, it can be ascertained that a fixed cost of $83,000 is present, plus $.78 per sales dollar of variable cost, with a break-even sales volume of $379,000.

Neither of the above solutions is correct, since it is known that the fixed cost of the equation is $80,000 and the actual points of break-even do not correspond to either of these solutions. The range of break-even points established by the two solutions encompass a sales swing of $94,000, i.e., $379,000 as opposed to $285,000. This divergence, resulting from "incidental" changes in product mix, casts considerable doubt on the validity of the fixed break-even approach.

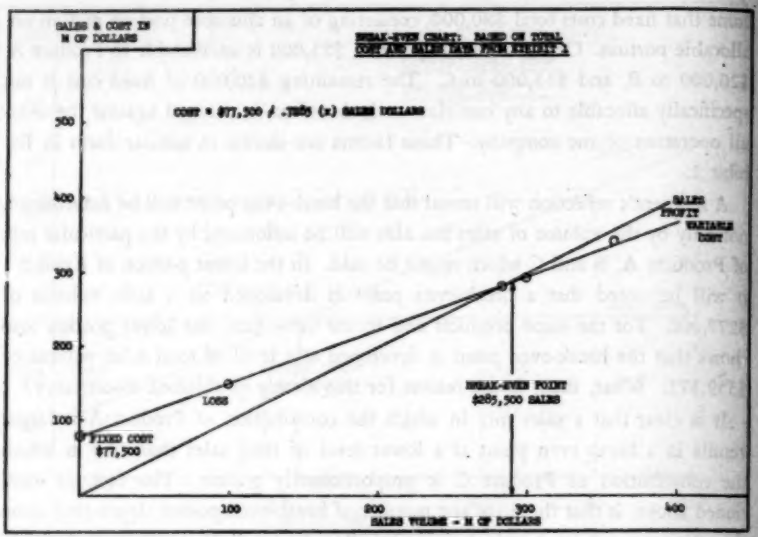


EXHIBIT 4

The divergence of break-even sales values was present even though a high degree of correlation was present in each of the data used. The plotting of these two sets of data is shown in Exhibits 4 and 5.

Although it would be possible to secure 100 per cent agreement between the equation and the Exhibits through the device of multiple correlation, the method is awkward and would have the highly unfavorable aspect of setting up a three dimensional figure. Beyond three product classes, the fourth dimension being unattainable on paper, the method would break down. It is because of the limiting factor of presentation that the polygraph chart plays its role so well in that it can relate a multiple series of numerical data almost without limitation.

The Profit-Polygraph Illustrated

To overcome the assumption of average proportions of product groups apparent in the break-even chart and to provide a means for anticipating the multiple effects on profit of a number of product groups, a linear or profit—polygraph has been devised, as shown in Exhibit 6. The polygraph, as has been noted, is nothing more or less than an assembly of individual equations in convenient form, allowing cumulative or total effect of such individual equations to be quickly appraised. It removes from the equation variations develop-

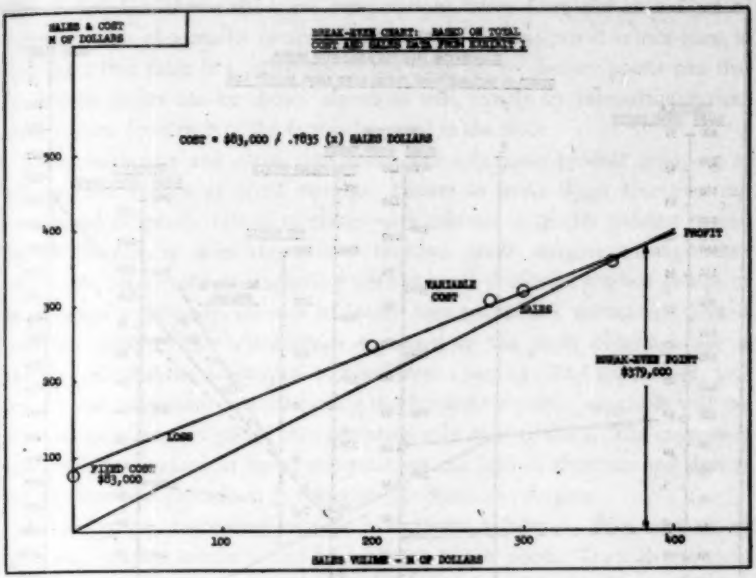
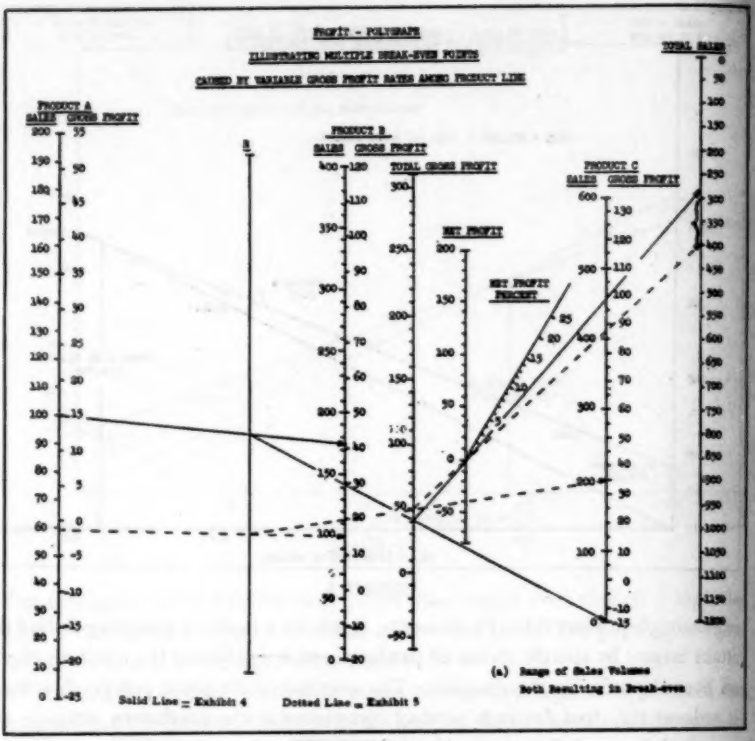


EXHIBIT 5

ing through product mix. Furthermore, it sets up a basis for analyzing failure to attain targets by specific classes of products, and it establishes the resulting effect on overall profits on the company. The essential of the profit polygraph is that it reduces the chart for each product component in the break-even situation to a vertical line scaled on both sides, on one with sales volume and on the other with related profit. These lines can then be placed on the same chart and then graphically related to the company situation as a whole.

While the original development of the polygraph takes more time and calls for a better technical knowledge than does the break-even chart, it has a considerably longer life from the standpoint of stability and, at any time, it can be put to a more comprehensive use because of its greater flexibility. Once set up, polygraphs are relatively easy to use for a wide variety of applications in profit analysis, budgeting, development of standard data, etc. The profit polygraph in Exhibit 6 may be regarded as typical. It illustrates that multiple break-even points can result from total sales of varying mixes. Two illustrations taken from the supplementary profit and loss analysis have been superimposed on this chart. The solid line shows the break-even point developed from a sales volume of $277,777. The dotted line shows another break-even point developed from total sales volume of $359,375. To achieve these results, it is necessary only to



GENERAL INSTRUCTIONS:-

1. ASSEMBLE SALES DATA FOR EACH PRODUCT GROUP (A, B, AND C) AND THEIR COMBINED TOTAL.
2. CONNECT APPROPRIATE SALES OF PRODUCT A WITH SALES OF PRODUCT B AND MARK POINT OF INTERSECTION ON LINE R.
3. CONNECT POINT INTERSECTED ON R WITH SALES OF PRODUCT C AND READ TOTAL GROSS PROFIT AT POINT SO INTERSECTED ON THE TOTAL GROSS PROFIT LINE.
4. CONNECT TOTAL GROSS PROFIT POINT WITH TOTAL COMBINED SALES ON THE TOTAL SALES LINE. THE INTERSECTION OF THIS LINE WITH THE NET PROFIT LINE AND THE NET PROFIT PERCENT DIAGONAL INTERSECTED NET PROFIT AND NET PROFIT PERCENT RESPECTIVELY.

EXHIBIT 6

refer to the sales data shown in the analysis. The steps are as follows, at the total sales level of $277,777:

1. Connect sales of Product A ($100,000) with sales of Product B ($177,777). This line connecting Products A and B will intersect reference line R at (x).
2. Connect intersection (x) on reference line R with zero sales of Product C, as shown in Exhibit 1. The result will intersect the total gross profit line at $42,777. (Note: Although this line has been referred to as the total gross profit line, it could also be called the directly allocable cost and profit line.)
3. Connect the point of intersection of total gross profit ($42,777) with the total sales line at the point of $277,777. The resulting net profit can then be read on the net profit line as being zero or break-even.

The dotted line shows the same computations taken from the second set of figures, which also results in zero profit. From this analysis it is not hard to determine that there is a difference in the range of break-even points and that break-even points can be chosen almost at will, simply by forecasting various contributions from each of the factors included in the chart.

Good marketing and accounting techniques rely upon product grouping to achieve sales volume at profit margins. Failure to attain target objectives can be ascribed to specific failure to obtain sales volumes in specific product classes. By predetermining sales targets and required profit margins, management's efforts can be directed to improving sales in more profitable product groups or to developing necessary volumes in leader lines which will sustain and protect corporate profits. The relationships expressed in the profit polygraph are as already indicated, an adaptation of break-even charting. The appearance, procedure, and time spent in constructing the break-even profit-polygraph will improve as experience is gained through practice in making it up. The experience and confidence gained in linear computations can lead to shortcuts and devices which reduce the procedures to rather simple chart construction.

A number of observations may be made from Exhibit 6. Each segment of profit contribution can be found by reference to the graph. Through the manner of construction of the exhibit, both gross profit and net profit contributions can independently be determined. An additional advantage can be gained by the establishment of targets through the use of a net profit percentage line, which is useful because it shows not only the dollar amount of net profit, but also the percentage of net profit attained on sales. Further development of the same chart could be made to show also the rate of return on current assets or investments. Moreover, any segment on this chart can be developed along similar lines to disclose any reasonable number of variables. For example, when it is desired to know what the effect of a 10 per cent price increase in Product A compounded with a 5 per cent cost decrease in Product B would be, the chart could be interpreted to accomplish this. The number of combinations which can be achieved through this method is almost limitless, as long as the chart is readable and comprehensive.

Furthermore, the chart can be worked in a reverse direction by projecting a forecast total sales volume and a required net percentage of profit. From such a reverse computation, a total gross profit objective can be established. Various product group contributions can then be worked out by possible sales volumes in each product group. It may be found, for example, that by increasing the sales effort for Product C and establishing an advertising program for Product A, limitations on Product B because of a declining market can be overcome.

The point which should be noted is that, by the expenditure of some effort in the construction of the chart, it will provide quick and valid answers to a great number of pertinent combinations of fixed costs, variable costs, product mixes, rate of return on investment, investment turnover, and percentage of return on sales.

Profit-Polygraph Is Adaptable

We may conclude, therefore, that the profit-polygraph is a charting technique which can be readily adapted by management in furtherance of its profit targets. It overcomes limitations of the break-even chart. It does not assume a proportionate product mix at all levels of sales. By running a ruler across the various factors shown in the profit-polygraph, points of intersection can be developed and answers can be quickly ascertained for almost any combination of factors within reason. The uses of the chart can be expanded or contracted by the introduction or withdrawal of variables. Each variable component, appearing separately, impels systematic appraisal by management of each cost and sales element in the total profit picture. The profit-polygraph, therefore, affords a quick disclosure of specific courses of action, which can maximize profits while minimizing the time and effort spent in developing sound corporate objectives.

Fixed Cost and Product Mix Control by Activity Analysis

by WALTER KENNON

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This article is a simplified explanation of activity analysis, a new technique for use in planning business operations. The description is given in terms easily understood by managers and accountants. The technique is applied to an example in control of product mix and fixed cost because it has some very important implications for the control of these factors, one of which is its serviceability in view of the limitations of standard cost in this area.

THERE IS A NEW TECHNIQUE that is being used very successfully for certain planning problems. The technique is based upon the analysis of the input and output factors of different production operations called activities. After analyzing the input and output requirements, it is possible to plan future activities which will accomplish some given objective with minimum cost. Because different methods for reaching the objective are analyzed in terms of activities, this new technique is called "activity analysis." On the other hand because linear input-output relationships are assumed, the technique is sometimes known as "linear programming." The control of product mix and of fixed cost is probably the most important problem which can be solved with the aid of activity analysis.

It is fortunate that this new technique can be easily applied to the control of product mix and fixed cost because this is the area in which little planning seems to have been done. The problem of product mix has been approached as a problem in financial accounting or product costing, rather than a problem in planning and control. That is, major emphasis has been given to the allocation of cost to the different products produced, in order to correctly determine inventories on the balance sheet and the cost of goods sold on the income statement. Only minor emphasis has been given to the selection of the most profitable product mix. A further reason that the planning aspect of product mix has been given little attention is that it has been generally believed that product mix is uncontrollable in most cases. When this second reason for giving little attention to the control of product mix is examined, it is not very forceful. Profit mix is the make-up of production in the aggregate. Managers can certainly take action to affect the proportions in which products are produced, if profit is at stake, as it clearly is. (This is not to deny the existence of market factors affecting mix.)

It must be acknowledged that the example selected to illustrate activity analysis in this article is so simplified that it quite likely does not correspond to a real production situation. It involves only two products in the product mix and assumes that hours worked are the only factor limiting production. Two products and one limiting factor have been selected for the example in order to use figures with only three dimensions. In more complicated cases, graphic presentation fails. However, the single problem is illustrative, and advanced mathematics contains analytical techniques which can be used for any number of variables. Whatever detailed techniques are involved, the analysis will proceed along the same lines. Familiarity with the concept will engender trust in both simple and more advanced applications for which specialized help may be needed.

Two Products, Five Operations, Ten Hours of Production

The example used here illustrates the application of activity analysis to the control of product mix and fixed cost. As already indicated it is greatly simplified. It is also hypothetical. It assumes two products, A and B. These are produced jointly in one department of the supposed company. The operation of the department on a normal shift basis costs $250 per hour. In the department, there are five different activities, V, W, X, Y, and Z. Each is a production method or process by which substantially the same amounts of material, labor, and overhead can be combined to produce the two products. A change from one activity to another requires only minor adjustments of the machines and does not change the total costs of operating the activity ($250 per hour). It is assumed that each activity can be used to produce a different proportion of Products A and B.

Plotting the Mixes

It is assumed that, if the department is operated for ten hours (costs of $2,500), any one of the following product mixes can be produced:

ACTIVITY	PRODUCTS	
	A	B
V	0	20
W	9	18
X	11	10
Y	16	8
Z	18	0

This same idea can be presented graphically with greater clarity. This device will be followed throughout this paper, although an increase in the number of variables would make graphical presentation impracticable and mathematical

Each point on this chart represents production resulting from 10 hours of operation of an activity (V, W, X, Y, or Z) at assumed cost of $250 per hour, regardless of activity.

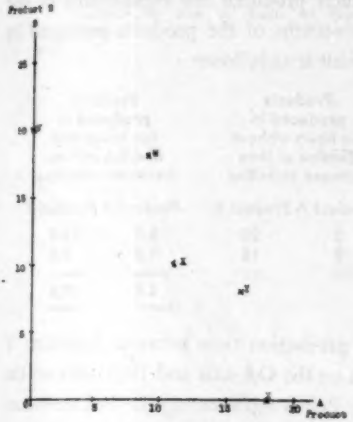

EXHIBIT 1

This chart adds to previous chart (Exhibit 1) Point p, likewise representing production from 10 hours of operation (8 hours of Activity V and 2 hours of Activity W) at same cost. (Note that Point p is on line with Points V and W.)

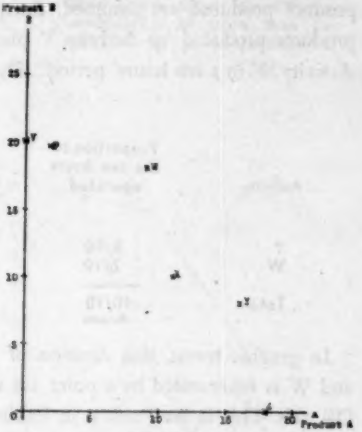

EXHIBIT 2

presentation necessary. For any number of variables, the analysis would be of the same type. In Exhibit 1, the quantity of Product A is plotted on the horizontal axis OA. The quantity of Product B is plotted on the vertical axis OB. Each product mix which can be produced with ten hours of operations is represented by a point on the figure. Because variations in the product mix are caused by changes from one activity to another, each point not only represents a different product mix but also represents a different activity. For example, Activity V produces none of Product A and twenty units of Product B in ten hours. Therefore the point V is at the point zero on the OA axis and twenty units on the OB axis. Activity W produces nine units of Product A and eighteen units of Product B in ten hours. Therefore the Point W is at the point nine units on the OA axis and eighteen units on the OB axis. Each activity is similarly represented by a point on Exhibit 1.

Varying the Division of Time Between Activities

It is assumed further that it is not necessary to operate one activity for the full ten hours but that the time can be divided among activities. For example, one activity can be operated part of the time and another activity can be operated

for the remainder of the time. This results in product mixes other than those represented by the points on Exhibit 1. For example, if Activity V is operated for eight hours and Activity W is operated for two hours that is, Activity V is operated for eight-tenths and Activity W is operated for two-tenths of the ten hours' period and if linear relationships between the hours operated and the product produced are assumed, the products produced are eight-tenths of the products produced by Activity V plus two-tenths of the products produced by Activity W in a ten hours' period. This result is as follows:

Activity	Proportion of the ten hours operated	Products produced in ten hours without division of time between activities		Products produced in ten hours with division of time between activities	
		Product A	Product B	Product A	Product B
V	8/10	0	20	0.0	16.0
W	2/10	9	18	1.8	3.6
Total	10/10			1.8	19.6

In graphic terms, this division of the production time between Activities V and W is represented by a point 1.8 units on the OA axis and 19.6 units on the OB axis. This is the Point p in Exhibit 2. Points representing the full ten hours for each activity are also plotted. (These points are the same as those in Exhibit 1.) The division of the ten hours is arbitrary (eight hours for Activity V and two hours for Activity W). There are many other divisions of time between activities. However, it is obvious that any division of time between Activities V and W is represented by a point which lies on a straight line between the Points V and W. Likewise the division of production time between any two activities is represented by a point on a straight line connecting the two activities. These many different divisions of production time are represented by the lines in Exhibit 3.

The lines in Exhibit 3 do not exhaust all of the product mixes possible, because there may be some idle time, i.e., no activity. Idle time results in less product than can be produced with some activities operating full time. In graphic terms, any combination of activities and idle time is represented by a point within the area OVWYZO of Exhibit 3. Likewise, if the ten hours are divided among more than two activities, the resulting product mix is represented by a point within the area OVWYZO. For example, if the ten hours of operating time are divided among Activities V, W, and Y, the resulting product mix is represented by a point within the area VWYV. The specific point depends upon the particular division of time among activities. Thus, by the appropriate division of time among activities and by the possible use of some idle time it is

This chart adds product mix lines connecting activities. The points on each line exhaust the product mixes for 10 hours operation divided between the two activities involved. (Idle time would lower output of one or both of the products.)

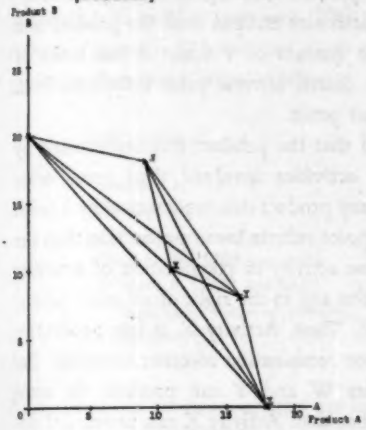

EXHIBIT 3

This chart modifies the preceding chart (Exhibit 3) to retain only those product mix lines which show highest productivity for the $2500 cost assumed for 10 hours of operation. (See text for demonstration that Point q — or any other interior point — signifies either some idle time or combination of more than two activities for lower production.)

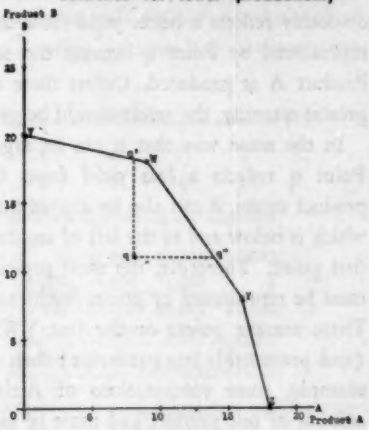

EXHIBIT 4

possible to produce any product mix represented by a point within the area OVWYZO. It is impossible to produce a product mix which would be represented by a point above or to the right of the line VWYZ, because there is no activity or combination of activities that yields such a product mix.

Relative Productivity (Potential Profitability) of Different Activity Combinations

After examining the position of some of the points within the area OVWYZO, it is apparent that some activities represented by points are obviously more productive (and hence potentially more profitable) than the activities represented by other points. For example, select the Point q in Exhibit 4. This point represents the fact that, by a suitable selection of activities and idle time, eight units of Product A and eleven units of Product B can be produced. There is a Point q′ directly vertical to the Point q and on the line VW. This Point q′, represents the fact that, by some combination of Activities V and W, 8.0 units of Product A and 18.2 units of Product B can be produced. If the product

mixes represented by the Points q and q′ are compared, the products represented by the Point q′ are in greater quantity than the products represented by the Point q because q′ represents the same amount of Product A but more of Product B. Similarly, there is a Point q″ directly to the right of the Point q and on the line connecting the Point W and the Point Y. This Point, q″, represents a combination of activities W and Y which will yield 13.9 units of Product A and 11.0 units of Product B. Thus, the product mix represented by Point q″ obviously reflects a better yield from the activities utilized than the product mix represented by Point q because the same amount of Product B but more of Product A is produced. Unless there are drastic adverse price influences from greater quantity, the result should be greater profit.

In the same way that it can be argued that the product mix represented by Point q reflects a less yield from the activities involved than some other product mixes, it can also be argued that any product mix represented by a point which is below and to the left of another point reflects lower production than the first point. Therefore, the most productive activity or combination of activities must be represented by points furthest above and to the right of all other points. These are the points on the line VWYZ. Thus, Activity X is less productive (and presumably less profitable) than some combination of other activities. For example, some combinations of Activities W and Y can produce the same amount of one product and more of another than Activity X can produce. Likewise any product mix which results from combining Activities V and Y reflects lower productivity than some product mixes from combinations of Activities V and W or from combinations of Activities W and Y. Therefore, because any product mix represented by a point within the area OVWYZO is obviously of lower quantity than a product mix represented by a point on the line VWYZ, only the product mixes represented by points on the line VWYZ will be considered for planning purposes in the remainder of this illustration. This line, VWYZ, is referred to as the product mix line.

Identifying the Most Profitable Product Mix

Without knowing the sales value of Product A relative to the sales value of Product B or, conversely, the value of Product B relative to Product A, the most profitable product mix cannot be determined and activities planned to produce the particular mix. For example, Activity V yields none of Product A and twenty units of Product B. Activity W yields nine units of Product A and eighteen units of Product B. Therefore, if nine units of Product A (nine minus zero) are more valuable than two units of Product B (twenty minus eighteen),

then Activity W is more profitable than Activity V and should, therefore, be planned. However, if the reverse is true (if nine units of Product A are less valuable than two units of Product B), then Activity V is more profitable than Activity W and should be planned. Obviously the final determination of the most profitable activity cannot be made until relative value is known.

In order to illustrate the determination of the most profitable product mix, assume that the sales price of Product A is $200 per unit and that the sales price of Product B is $300 per unit. The profit from each activity is calculated as follows (Activity X is omitted from consideration, because it is obviously less profitable than some other activities):

Units produced	Activity V	W	Y	Z
Product A	0	9	16	18
Product B	20	18	8	0
Sales value of product				
Product A ($200 per unit)	$ 0	$1,800	$3,200	$3,600
Product B ($300 per unit)	6,000	5,400	2,400	0
Total sales value of product	$6,000	$7,200	$5,600	$3,600
Process cost	2,500	2,500	2,500	2,500
Profit	$3,500	$4,700	$3,100	$1,100

If combinations of two activities are not considered (combinations will be considered later), Activity W is the most profitable activity, with a profit of $4,700 for the ten hours of operation. Activity Z is the least profitable, with a profit of $1,100. It is also apparent that the comparison is the same if the process costs of $2,500 are omitted. These costs are the same, regardless of the particular activity selected. This is to say, that the most profitable activity is the one which produces the largest total product value regardless of fixed costs. For example, in terms of total product value, Activity W is the most profitable because it produces a total value of $6,000; Activity Z is the least profitable because it produces a total value of $3,600. Thus, in this department, Activity W is selected as the most profitable.

Because total product value depends upon product mix and because some mixes have the same value as some other mixes, it is possible to select those product mixes which have the same product value. For example, assume that $4,900 total product value is to be produced. This value can be produced by many different mixes of Products A and B. For example, it can be produced by two units of Product A and fifteen units of Product B. Two units of Product A at a value of $200 per unit, or $400, plus fifteen units of Product B at $300

per unit, or $4,500, comes to a total value of $4,900. Likewise, the total product value of $4,900 can be produced by five units of Product A at $200 per unit plus thirteen units of Product B at $300 per unit. These and other product mixes which yield $4,900 total value are tabulated as follows:

Product A		Product B		Total product Value
Units	Product Value at $200 per unit	Units	Product value at $300 per unit	
2	$ 400	15	$4,500	$4,900
5	1,000	13	3,900	4,900
8	1,600	11	3,300	4,900
11	2,200	9	2,700	4,900
14	2,800	7	2,100	4,900
17	3,400	5	1,500	4,900

From this tabulation it is evident that all mixes of Products A and B which yield a total value of $4,900 are represented by the following equation: $\$200A + \$300B = \$4,900$. In this equation "A" and "B" refer to the quantity of Products A and B. This equation can be plotted on a graph, such as Exhibit 5. In this figure the amount of Product A is plotted along the horizontal axis, OA. The amount of Product B is plotted along the vertical axis, OB. It is obvious that the line representing all product mixes having a value of $4,900 lie in a straight line.

Likewise, other straight lines can be drawn to represent other total product values. To illustrate, lines have also been drawn in Exhibit 5 to represent total values of $7,200 and $8,400. The position of these three lines (representing values of $4,900, $7,200, and $8,400) makes it evident that a line representing a greater product value than another line is above and to the right of the first line. It is obvious that this is true, because a line above and to the right of another line represents a larger amount of product. Also, because the value per unit of product ($200 per unit of Product A and $300 per unit of Product B) is constant, all of these lines are straight lines and are parallel to each other. These straight parallel lines are known as product value lines.

It is obvious that the most profitable activity is that activity which is represented by a point on the value line representing the largest value. For example, in Exhibit 5, many combinations of different activities and idle time can be used to produce a product value of $4,900. However, activity W is the only activity which can yield a product value as great as $7,200. There is no activity which can yield a product value as great as $8,400. It is therefore, evident that the point of tangency between the product value line and the product mix line is the point which represents the most profitable activity. In this particular example, this is the point representing Activity W.

On this chart there are drawn product value lines at assumed prices. Note that the largest value for any activity is Activity W, which is the Point of Tangency between the $7200 product value line and product mix line. (The product mix line represents $2500 cost.)

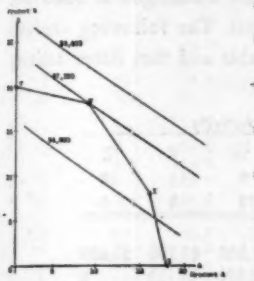

EXHIBIT 5

This chart depicts change in Point of Tangency between the product value line and the product mix line. ($4000 product value at Activity Y with $2500 cost.) This results from a change in the relative value of Products A and B.

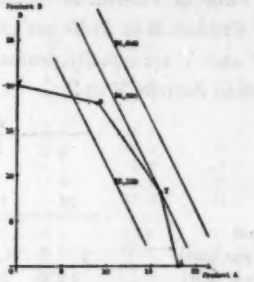

EXHIBIT 6

This chart portrays a situation in which Activities W and Y are equally profitable. (See explanation in text.)

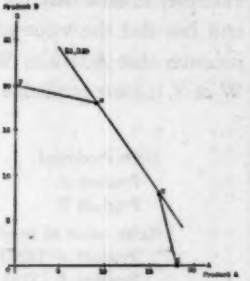

EXHIBIT 7

Considering Effects of Changes in Product Value

If the relative value of different products changes, the most profitable activity also changes. For example, assume that the value of Product A remains at $200 per unit but that the value of Product B changes from $300 per unit to $100 per unit. The following calculation of product value makes it evident that Activity Y instead of Activity W is then the most profitable activity:

	Activity			
	V	W	Y	Z
Units Produced				
Product A	0	9	16	18
Product B	20	18	8	0
Sales value of product				
Product A ($200 per unit)	$ 0	$1,800	$3,200	$3,600
Product B ($100 per unit)	2,000	1,800	800	0
Total sales value of product	$2,000	$3,600	$4,000	$3,600

Because the technical input and output factors of all activities have not changed, the change in the most profitable activity from Activity W to Activity Y must be due to the change in the relative value of Product A to Product B.

This can also be expressed graphically. In Exhibit 6 the product mix line is the same as it has been in previous figures, but the slope of the product value lines is different from the slope of these lines in Exhibit 5. This is due to a

change in the relative value of the products. This change in slope means that the tangency of the product mix line with the product value lines is at Activity Y instead of Activity W. Thus, Activity Y is the most profitable activity for this new condition of relative product values.

If the technical substitution of Product A for Product B (the slope of the product mix line) is the same as the relative value of Product A to Product B (the slope of the product value lines), two activities are equally profitable. For example, assume that the value of Product A remains unchanged at $200 per unit but that the value of Product B is $140 per unit. The following analysis indicates that Activities W and Y are equally profitable and that either activity W or Y is more profitable than Activity V or Z.

	Activity			
Units Produced	**V**	**W**	**Y**	**Z**
Product A	0	9	16	18
Product B	20	18	8	0
Sales value of product				
Product A ($200 per unit)	$ 0	$1,800	$3,200	$3,600
Product B ($140 per unit)	2,800	2,520	1,120	0
Total sales value of product	$2,800	$4,320	$4,320	$3,600

This case is presented graphically in Exhibit 7. The product value line representing a value of $4,320 is not tangent to the product mix line at a point, but this product value line is the same as the product mix line between the points representing Activities W and Y. This indicates that Activities W and Y are equally profitable. It also indicates that any combination of Activities W and Y is as profitable as any other combination. Managers may properly be indifferent in their selection of Activity W or Y or of any combination of the two activities.

Thus, the most profitable activity depends upon the relative value of products. Usually there is a single activity which is the most profitable. However, under special conditions, where relative value is the same as technical substitution, two activities are equally profitable and any division of time between activities is as profitable as any other division. Therefore, because the usual case is where one activity is the most profitable and because the special case where two activities are equally profitable causes no analytical difficulties, combinations of activities can be ignored in this analysis.

Considering the Effects of Variations in Hours of Operation

Although variations in activities or combinations of activities have been considered, there is another variable—variation in the number of hours during which the department is operated. So far the example has been based upon the

PRODUCT COMBINATIONS THAT RESULT
FROM VARIATIONS IN ACTIVITY AND HOURS OF OPERATION

Hours of Operation	Activity V Product A	V Product B	W Product A	W Product B	Y Product A	Y Product B	Z Product A	Z Product B
1	0.0	2.0	0.9	1.8	1.6	0.8	1.8	0.0
2	0.0	4.0	1.8	3.6	3.2	1.6	3.6	0.0
3	0.0	6.0	2.7	5.4	4.8	2.4	5.4	0.0
4	0.0	8.0	3.6	7.2	6.4	3.2	7.2	0.0
5	0.0	10.0	4.5	9.0	8.0	4.0	9.0	0.0
6	0.0	12.0	5.4	10.8	9.6	4.8	10.8	0.0
7	0.0	14.0	6.3	12.6	11.2	5.6	12.6	0.0
8	0.0	16.0	7.2	14.4	12.8	6.4	14.4	0.0
9	0.0	18.0	8.1	16.2	14.4	7.2	16.2	0.0
10	0.0	20.0	9.0	18.0	16.0	8.0	18.0	0.0
11	0.0	22.0	9.9	19.8	17.6	8.8	19.8	0.0
12	0.0	24.0	10.8	21.6	19.2	9.6	21.6	0.0
13	0.0	26.0	11.7	23.4	20.8	10.4	23.4	0.0
14	0.0	28.0	12.6	25.2	22.4	11.2	25.2	0.0
15	0.0	30.0	13.5	27.0	24.0	12.0	27.0	0.0
16	0.0	32.0	14.4	28.8	25.6	12.8	28.8	0.0
17	0.0	34.0	15.3	30.6	27.2	13.6	30.6	0.0
18	0.0	36.0	16.2	32.4	28.8	14.4	32.4	0.0
19	0.0	38.0	17.1	34.2	30.4	15.2	34.2	0.0
20	0.0	40.0	18.0	36.0	32.0	16.0	36.0	0.0

EXHIBIT 8

assumption that the department is operated for ten hours and that the problem is to select that activity or activities which will produce maximum profits on that basis. The effect of variations in the number of hours will now be analyzed. This effect can be determined easily if linear relationships between the quantity of product and hours of production are assumed. For example, if the department is operated for five hours instead of ten, only one-half of the product can be produced.

By reference to Exhibit 8 which tabulates production on this basis from one to twenty hours for each activity, it will be seen that, if it is operated ten hours, activity V produced none of Product A and twenty units of Product B. Therefore, if this activity is operated for only five hours, one-half of the ten-hour period, the activity produces none of Product A and ten units of Product B. Likewise, Activity W produces 4½ (9 ÷ 2) units of Product A and 9 (18 ÷ 2) units of Product B during a five-hour period. The table (Exhibit 8) can be used to find the product combinations possible with variations in each activity and in the number of hours operated. (The table does not contain all variations in the number of hours, because it does not contain the product yield for fractions of an hour).

In the same way that ten hours of operating time can be divided between

activities, any number of operating hours can be so divided and thus produce different product combinations which are represented by straight lines between points representing different activities. This idea can be expressed in graphic form, as in Exhibit 9. This chart is three-dimensional and has one vertical axis (OH) and two horizontal axis (OA and OB in perspective).

In this figure the quantity of Product A produced is plotted along the OA axis. The quantity of Product B produced is plotted along the OB axis. The number of hours operated is plotted along the OH axis (from top to bottom). The scale for the number of hours is not in previous graphs. This third factor makes it necessary for this chart to be three-dimensional. All points which represent different product combinations obtained by varying the activities and by varying the number of hours operated are on the surface of the pyramid. Each edge of the pyramid, such as the edge OW, represents the product combinations which can be produced with a given activity, such as Activity W, by varying the number of hours of operation. The surfaces between the edges represent product combinations which can be produced by the use of two activities and by varying the number of hours operated. A cross-section of the pyramid parallel to the base represents all product combinations which can be produced with a given number of hours with different activities. For example, the product mixes which can be produced in ten hours of operating time, the case analyzed earlier in this atricle, are represented by points on the cross-section of a plane parallel to the base at the ten-hour level on the OH axis.

It is obvious that any product mix represented by a point on the pyramid is more valuable than a product mix represented by a point within the pyramid. A product mix represented by a point outside the pyramid is unattainable with the number of hours and the activities available. Hence, only points on the surface of the pyramid are considered. This argument is, of course, the same as the argument for considering only the points on a product mix line. The surface of the pyramid is called the product mix surface because the concept is analogous to the concept of the product mix line discussed earlier in this article.

Product Value

The value of the product varies with the quantity produced and not with the number of hours required for production. Thus, a surface which represents constant product value is a plane perpendicular to the base of the pyramid, such as the PP plane in Exhibit 10. This perpendicular plane, PP, represents a total product value of $7,200 if the price of Product A is $200 per unit and the price of Product B is $300 per unit. This plane is known as a product value plane

Each point on lines forming edges of this pyramid represents amounts of Products A and B resulting from the single activity to which the particular line is related, up to twenty hours of operation. (Note that the pyramid floor depicts relationships resembling those in the two-dimensional chart, Exhibit 4.)

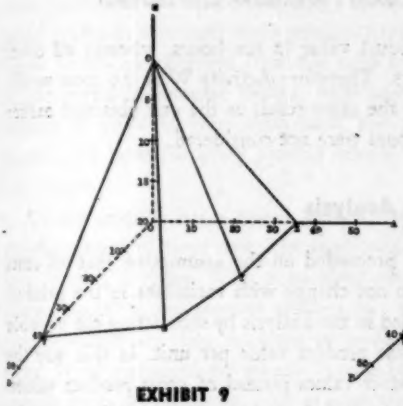

EXHIBIT 9

This chart reproduces the pyramid in Exhibit 9 and adds a vertical product value plane representing $7200 product value and disclosing Activity W as requiring least hours to attain it.

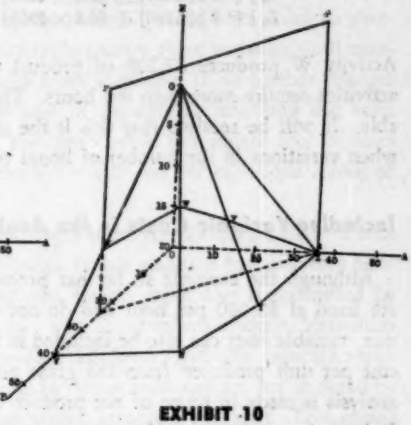

EXHIBIT 10

because this concept is analogous to the concept of the product value line discussed earlier in this article.

The line v, w, y, z, where the pyramid surface and the product value plane intersect, represents all product mixes identified with points on the surface of the pyramid and which yield $7,200 of product value. The most profitable point on this line is obviously that point representing the usage of the smallest number of hours. In this example this is the Point w. This analysis can be approached in a slightly different way by determining how many hours are required for each activity to yield $7,200 in product value. Let V_h, W_h, Y_h, and Z_h represent the number of hours required for each activity to yield $7,200 in product value. If linear relationships are assumed, each activity produces in one hour one-tenth of the product that it produces in ten hours. Production per hour for each activity can, therefore, be determined as follows:

	Production in ten hours		Production per hour	
Activity	Product A	Product B	Product A	Product B
V	0	20	0.0	2.0
W	9	18	0.9	1.8
Y	16	8	1.6	0.8
Z	18	0	1.8	0.0

In the example, it is assumed that $200 per unit is the value of Product A and $300 per unit is the value of Product B. The number of hours required for each activity to produce $7,200 product value can be determined from the following equations:

$$V_h\ (\ (0.0 \times \$200) + (2.0 \times \$300)\ ) = \$7{,}200 \text{ or } V_h = 12.0 \text{ hours}$$
$$W_h\ (\ (0.9 \times \$200) + (1.8 \times \$300)\ ) = \$7{,}200 \text{ or } W_h = 10.0 \text{ hours}$$
$$Y_h\ (\ (1.6 \times \$200) + (0.8 \times \$300)\ ) = \$7{,}200 \text{ or } Y_h = 12.9 \text{ hours}$$
$$Z_h\ (\ (1.8 \times \$200) + (0.0 \times \$300)\ ) = \$7{,}200 \text{ or } Z_h = 20.0 \text{ hours}$$

Activity W produces $7,200 of product value in ten hours, whereas all other activities require more than ten hours. Therefore Activity W is the most profitable. It will be recalled that this is the same result as the one obtained earlier when variations in the number of hours were not considered.

Including Variable Costs in the Analysis

Although the example so far has proceeded on the assumption that all costs are fixed at $2,500 per hour and do not change with variations in the product mix, variable costs can also be included in the analysis by subtracting the variable cost per unit produced from the gross product value per unit. In this way the analysis is made in terms of net product values instead of gross product values. It is obvious, of course, that the method of analysis is the same. For example, assume that Product A has a value of $200 per unit and variable costs of $50 per unit. Also assume that Product B has a value of $300 per unit and variable costs of $75 per unit. This means that the net value of Product A is $150 ($200 less $50) and that the net value of Product B is $225 ($300 less $75). The analysis for selecting the most profitable activity is the same, except that net values instead of gross values are used.

Better Than Standard Costs for Control of Capacity Utilization

Probably the most important implication of activity analysis is the idea that, once a certain amount of productive capacity has been acquired, the cost of that capacity is irrelevant in making decisions for the use of that capacity. The control of fixed cost, therefore, consists of two subdivisions: (1) the control of the cost of providing the capacity, and (2) the control of capacity utilization after a fixed capacity is provided. Budgeting is probably the best tool for the control of the cost of providing capacity, i.e., to estimate the long-term prospects for sales and inventory requirements, total capacity required, and the cost of providing it.

Activity analysis has a specific implication for the control of capacity utiliza-

tion, the second subdivision of the control of fixed cost. Such analysis helps managers to select activities and product mixes which result in the greatest return within the limits of capacity. Those products should be produced which will yield the maximum return above variable cost per unit of capacity. For example, oil refineries should produce products which yield the greatest gross profit per hour of distillation time. As another example, department store managers ordinarily have some control over the products offered for sale, the sales price, and the space (capacity) given to each product. In order to maximize profits in this case, managers continually change these variables until maximum profits are obtained from the sales space available. If no further changes in the variables increase profits, each unit of capacity is returning the same amount of profit as every other unit. The gross profit per square foot of sales space is the same for every product offered for sale and for each square foot of sales space.

Activity analysis has a rather serious implication for standard cost as a tool for the control of fixed cost. The implication is that standard cost is a very poor tool for this purpose. With a standard cost system, fixed cost is controlled by comparing the actual amount of fixed cost with the standard amount. Variations from standard are then analyzed by budget, efficiency, and idle capacity variations. These variations are usually in total by department and are not in detail by specific items of fixed cost, such as supervision, insurance and rent. This means that standard cost is a poor tool for the control of the cost of capacity provided, the first subdivision of fixed cost control. This is because the variation between actual and standard cost is not analyzed by specific items in order to direct managerial attention to those requiring attention.

Neither does a standard cost system direct attention to the way in which capacity is utilized and the ways in which it might be better utilized. The efficiency variance indicates whether or not the products which were planned for production were produced in more or less than the standard time. The idle capacity variance indicates how much of the capacity was not utilized for the production of any product. Neither of these variances directs attention to products which might be produced with the available capacity for a larger profit or to possible uses for idle capacity. Therefore, standard cost is not a very effective control tool for either of the two subdivisions of the control of fixed cost. This is not to imply that standard cost is not useful for the control of variable cost. Standard cost is probably the best tool available for the control of this type of cost. The argument advanced here is that activity analysis does indicate that standard cost has some rather serious limitations and disadvantages for the control of fixed cost.

This study of activity analysis indicates at least one very important control tool for product mix and fixed cost. This tool is based upon the idea that the relevant measure for effective control of product mix and fixed cost is a measure of the way in which capacity is utilized. This measure is the profit per unit of capacity. It is not the usual analysis of fixed cost variances under a standard cost system. Managers will, therefore, be more effective if they measure sales returns above variable cost per unit of capacity, such as gross profit per square foot of sales space and value added to the product per hour of production time. In this way, managers will be better able to select the most profitable product mix and to utilize capacity most effectively.

Shall We Take Heavier Depreciation in Early Years?

by JOHN N. BELL

Student, Graduate School of Industrial Administration, Carnegie Institute of Technology

Not primarily an accounting article (but on a subject much discussed by industrial accountants), this paper relates faster early-year depreciation of fixed assets, now available under the Internal Revenue Code, to the economic objective of continued growth of industry. He does not find it necessarily true that the peace-time version can do for industry what accelerated amortization achieved for defense production, despite the temptation of analogy.

IN THE LANGUAGE of the accountant, depreciation is used to "describe broadly the cost or expense due to all the factors which cause ultimate retirement of property insofar as that cost is not included in current maintenance." (George O. May, *Financial Accounting* 1943 p. 118.) Depreciation so defined includes many factors which may contribute to the asset's loss in value. Three which are most important are wear and tear resulting from use, obsolescence resulting from technological progress, and changes in economic conditions. The object of depreciation accounting is to distribute these expenses equitably over the periods which benefit from the use of the equipment.

Of the methods used to apportion depreciation those which have been found chiefly serviceable in industry are: straight-line, unit of production, and diminishing balance. The straight-line method is most common and most widely used in this country. The base amount, usually original cost, is distributed in equal installments over the estimated useful life of the asset. Under the unit of production method, the original cost is divided by the estimated total production of the asset over its entire life. Depreciation for the period, therefore, is a function of the volume of production. With the diminishing balance method, the depreciation charge is determined by applying a given rate to the original cost minus the accumulated depreciation from preceding periods. Depreciation charges are heavier in the earlier periods of operation, than in later ones but the entire amount is never, theoretically, written off. This method has not been widely used in the United States. Of the methods mentioned, it most nearly fits the specification of accelerated amortization.

Applicability of Rapid Amortization to War and (Perhaps) Peace

During a national emergency, the need for war material necessitates rapid expansion of the nation's productive facilities through enlarged facilities in basic industries and new facilities of a specialized nature. These assets are often vulnerable to peacetime disuse. To induce the necessary expansion of facilities, Congress permitted, for tax purposes, "accelerated" or "quick write-off" depreciation policies during both World Wars and the Korean emergency, applicable only to depreciable assets essential to national defense.

The basic idea was the same on each occasion. World War II suppliers were authorized (provided they could obtain a certificate of necessity from the appropriate governmental agency) to amortize wholly or partly the cost of special facilities over a five-year period. Furthermore, it was provided that, if the war lasted less than five years after special amortization was started, depreciation could be recalculated to account for the equipment's actual life. There were some differences in the like provisions applied to the Korean conflict. Certificates of necessity issued by the Defense Production Administration stipulated that only a portion of the cost of emergency facilities, as determined by the agency, would be applicable to the five-year amortization provision. In some cases, however, certificates did cover full cost. A basic factor for determining the amount allowed for special amortization consideration was the prospect of post-amortization usefulness of the equipment. There was no provision for tax adjustments should the emergency last less than five years.

There is a logical basis for accelerated amortization of defense facilities, i.e., the probability that their useful life will be limited to the period of emergency. If a plant or machine ceases to be useful at the end of that time because it is worn out, obsolete, or represents excess capacity, it no longer contributes revenue. Its cost is properly chargeable to the period in which it did produce income. In other words, no difference is presented between the concepts of normal depreciation and accelerated amortization except one of degree based on the variation between normal and actual life of plant and machinery under operating conditions obtaining. It would be well to realize that many peacetime conditions have a similar effect. Loss of value due to economic obsolescense is as real a loss as loss of value due to physical deterioration which in turn is as real as costs associated with the and consumption of material and labor. There are no profits until provision is made for the cost of productive facilities. A policy of rapid amortization distributes these costs more realistically in light of special circumstances than do the straight line or other common methods based on a normal economic or physical life.

Investment Stimulus of Deferring Tax Burden

Aside from its value of realistically apportioning depreciation expense from the operating point of view, under conditions justifying it, rapid amortization provides equally important advantages with respect to the financing of new projects. A promoter who is eligible for special tax considerations because he has a bona fide order for defense material is assured a larger than normal cash throw-off from operations for the first five years, during which time he will be able to repay all or a major part of loans made to him. The abnormally high cash throw-off results from the large depreciation deductions which lower taxable income. Initially, this tax relief is of major significance in obtaining capital, enhancing the liquidity of both borrower and lender. In effect increased tax deductions are interest-free funds which can be used to retire debt or continue expansion.

There is another side to the picture, too. The increased tax burden during the post-amortization period, when these funds are paid back through increased taxes, is a consequence of accelerated amortization. The over-all effect, then, is to ease the current financing problems with the expectation that future increases in tax expense will be met out of current income rendered more certain because of the initial advantage.

Advantages Depend on Investment Status of Company

Consider the cases of firms using accelerated depreciation and representing various alternative rates of investment: increasing outlays, decreasing outlays, and constant outlays starting from a common level of investment. An expanding company may derive maximum advantage by using the accelerated depreciation method. (This case corresponds to emergency defense facilities.) Heavy new investment will produce heavy initial depreciation charges which, in turn, reduce taxable income. If the funds derived from this tax relief are reinvested in more depreciable assets, the tax burden for the following period will also be lower than normal, i.e., lower than that figured according to the straight-line depreciation method. These taxes would not be lost to the Government forever, but they would be postponed indefinitely with continued expansion. (Revenues would, of course, be lost if operations were suspended at the conclusion of the emergency.)

A company with a declining rate of investment may gain only a minimum advantage by using accelerated amortization. Most of its depreciable assets are probably old, with only a small portion of their original cost remaining to be

recovered. Current depreciation charges would be relatively small. Hence taxable income would be correspondingly higher. However, the full impact of higher taxes during the post-amortization period would have been partly offset by the earning power of additional funds generated during the amortization period.

Companies with an essentially constant rate of investment may realize a moderate advantage in using accelerated amortization. As new assets are accumulated, others become relatively old, the net result being a stable age distribution. The accelerated method will involve a greater write-off for new equipment but a smaller one for older items. As a result, the total combined depreciation charge and taxes each year may be just slightly less than they would be if the straight-line method were used. Here too, the earnings resulting from earlier cash throwback operate to partially offset higher taxes during the deceleration periods.

If the three progressions are confined to a common total investment, then the maximum advantage rests with the firm decreasing its investment each period, inasmuch as this condition necessarily implies maximum initial investment, therefore the earliest cash flow-back.

Straight-line vs. Acceleration: Facilities Expansion

The first section of this paper has discussed the broader aspects of accelerated amortization as a depreciation policy. We now turn our attention to a more formal comparison of the popular straight-line method with an accelerated amortization policy and the effect of the two methods on investment decisions. In general, equipment is valued according to its ability to contribute to net income. Equipment yields a net income over its life if the discounted value of all revenue attributed to it is in excess of the total discounted costs (initial cost plus maintenance). Mathematically this may be stated as follows:

$$P = (r_1v + r_2v^2 + r_3v^3 \ldots r_nv^n) + Sv^n - C$$

P = net profit derived from the equipment
r = net operating revenues not including depreciation
v = present worth factor (single payment)
C = original cost of equipment and maintenance (discounted)
S = salvage value

The initial decision of whether or not to buy new equipment depends upon the present worth of all the "rv's" plus the present worth of "S." Should the sum of these revenues exceed "C", a profit will be realized.

A change in depreciation policy affects the stream of profits indirectly by changing the time pattern of the tax payments (by varying the amounts of taxable income). It thereby alters the pattern of savings or profits from the investment. We will consider annual revenues after taxes but with depreciation charges,

calculated by the straight-line depreciation method, added back. This expression provides the total cash throw-off over the life of the equipment. In comparing the revenue streams resulting from the use of both depreciation methods, we may write the following:

Straight-line: $R_1 = \sum_{i=1}^{n} r_i v^i$ (1)

Accelerated depreciation: $R_2 = \sum_{i=1}^{k} (r_i + t_i) v^i + \sum_{i=k+1}^{n} (r_i - t_i) v^i$ (2)

Where:
R = total revenue or cash throw-off.
r = net operating revenue not including depreciation.
t = annual absolute difference in taxes resulting from accelerated amortization.
v = present worth factor (single payment)
1 to k = accelerated amortization period.
1 to n = estimated life of equipment.

The algebraic sum of all "t's" over time is zero. Whatever the tax reduction in the early period may be, it will be offset by an increase in taxes paid in subsequent periods, i.e., the sum of all undiscounted revenues over the entire lifetime remains the same, regardless of the depreciation method used. Since the distribution of the tax payments over time is different, the present worth of the revenue series (R_1 and R_2) is not the same. R_2 is greater than R_1 the difference depending upon the present worth factor's effect on "t".

Straight-Line Vs Acceleration: Facilities Replacement

Companies are often faced with a situation in which new and improved types of machinery become available before older equipment is worn out. Here the problem is to determine the optimum time for replacement. The revenues which would derive from the older equipment must be compared with those available through the immediate installation of new equipment. In comparing the present value of the revenue streams obtained by the use of straight-line and accelerated methods, we assume as before, that "r's" are the firms' revenues after taxes and that "t's" are the difference in taxes between the two methods. The prime sign signifies new equipment.

Postponed replacement:
Straight-line depreciation:

$$R_3 = \sum_{i=1}^{c} r_i v^i + \sum_{i=c+1}^{n} r'_i v^i \qquad (3)$$

Accelerated depreciation:

$$R_4 = \sum_{i=1}^{c} (r_i - t_i) v^i + \sum_{i=c+1}^{m} (r'_i + t'_i) v^i + \sum_{i=m+1}^{n} (r'_i - t'_i) v^i \qquad (4)$$

Immediate replacement:

Straight-line depreciation:

$$R_3 = \sum_{i=1}^{n} r'_i v^i \qquad (5)$$

Accelerated depreciation:

$$R_4 = \sum_{i=1}^{c} (r'+t')v^i + \sum_{i=c+1}^{n} (r'-t')v^i \qquad (6)$$

Where:

- **1 to c = remaining life of old equipment**
- **c to m = period of accelerated amortization resulting in lower taxes by the amount (t') over straight-line method**
- **m to n = period of low depreciation allowances resulting in higher taxes by the amount (t') over the straight-line method**

The two expressions representing the case of immediate replacement differ only by the effect of the discount factor "v." (The sum of the undiscounted "t's" over the lifetime of the equipment is zero). The equations for postponed replacement (R_3 and R_4) differ by more than the change in distribution of the revenues over time. If the firm is using accelerated depreciation, the sum of revenues obtainable from the old equipment is reduced by the sum of "t's" from time "1" to "c" or:

Subtracting: $R_3 - R_4$

$$R_3 = \sum_{i=1}^{c} r_i v^i + \sum_{i=c+1}^{n} r'_i v^i$$

$$R_4 = \sum_{i=1}^{c} (r_i - t_i)v^i + \sum_{i=c+1}^{m} (r'_i + t'_i)v^i + \sum_{i=m+1}^{n} (r'_i + t'_i)v^i$$

Equals:

$$R_3 = R_4 + \sum_{i=1}^{c} t_i v^i - \sum_{i=c+1}^{m} t'_i v^i + \sum_{i=m+1}^{n} t'_i v^i$$

Suppose that a firm, with a given expected stream of revenues, is using straight-line depreciation and finds that it would be better to postpone replacement (R_3 greater than R_5). Under the assumed conditions it is possible that, if the same firm were using accelerated amortization, the decision could be reversed (R_6 greater than R_4) because of the tax difference during the period "1" to "c". Thus, the use of accelerated depreciation might be expected to increase the value of immediate replacement during the rest of the expected life of the present equipment.

It must be recognized that in most cases, considerations other than those dealt with here arise which have an appreciable effect on business investment policies. There may be changes in the company's liquidity position or funds may not be

available to carry out decisions indicated by revenue calculations. Depreciation policy is by no means the sole determinant of these decisions but is certainly one important factor.

Is Rapid Amortization Good Medicine for the Economy?

In our society continued investment by business and individuals is one driving force behind economic stability and growth. The major portion of this investment is devoted to expansion and modernization of productive facilities. If accelerated amortization worked well as a stimulus in emergencies, would it not also produce the same results during peacetime? Such a policy would have the basic advantages outlined earlier with respect to wartime conditions. In effect it would induce investment by enabling firms to match more closely current revenues with actual costs of plant and equipment.

The availability of tax benefits from faster early-year depreciation does pose a real problem. Quicker (than straight-line) write-off of new capital equipment through diminishing balance methods was approved as a part of the 1954 revision of the Internal Revenue Code and went retroactively into effect as of January 1, 1954. Its provisions are aimed at providing incentives for investment in new capital goods, thereby obviating one potential cause of a general business recession. This legislation is one means of coping with a serious problem regarding capital goods investment. Spending for new capital goods has played a major role in the post-war boom. Currently about $30 billion is spent yearly for producer durables and many economists believe that this rate cannot be sustained under old tax laws. Several factors support their belief. Between 1942 and 1954 the stock of capital equipment more than doubled. Hence half of the present facilities are less than five years old. Further, the major impetus of the post-war boom in capital spending came from enlarging the nation's productive plant. As a result the post war needs for additional productive capacity may have been largely filled. We may be approaching the time when the amount of capital spending will be determined by the replacement rate of older plants plus some amounts to allow for increased demand due to higher standards of living and a growing population. Thus, if as already suggested, accelerated amortization will promote replacement of older equipment, it will hence contribute to maintaining present high level of capital investment.

However, there are several reasons why accelerated amortization is not a panacea for capital investment problems. First, the accelerated methods may serve to accentuate business cycles if generally adopted. In periods of prosperity, when most businesses are expanding, tax considerations would represent an

additional incentive for continued expansion. On the other hand, during a recession when most firms are contracting (declining investment rate), the downward trend would be aggravated by an increase in the tax burden. Such fluctuations do not contribute to a stable economy.

Second, firms would not necessarily choose to take advantage of accelerated depreciation even if it were permitted. Rapid write-off of plant and equipment may not serve their best interests for reasons other than those which have been noted. These other considerations are future expectations with respect to tax rates and other factors. If tax rates are to rise or excess profit taxes are a possible event, quick write-off of assets would be unwise, since this would leave larger taxable incomes susceptible to higher tax rates.

There are several other practical factors which would bear heavily on decisions of whether or not to adopt a rapid depreciation policy. Depreciation policy is usually administered by controllers, accountants, and treasurers—a reasonably conservative group. These men would want to know how lower earnings in years involved would affect, among other things, the price of company stock, the established pattern of earnings with respect to dividends, the attitude of stockholders, executive incentive plans based on stock prices or level of earnings, etc.

In the last analysis, the effect of accelerated amortization on economic conditions is in large part controlled by what the business man thinks of future conditions and the effect these conditions will have on the business community. It is, however, also a problem to which management's attention should be drawn, for it concerns the growth and fortunes of the firm.

Scheduled Preparation of a Budget Program

by KELVIN L. SHIELDS

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Two features stand out in this narrative of the sequence of budget preparations in a company having numerous operating divisions. One is application of the idea of guidance of the activity by a control unit acting for top management. The other is application of definite scheduling of the forward-looking steps which bring budget data into the control section in the early fall and results in complete consolidated and divisional programs by the middle of December.

OUR BUDGET PROGRAM—we commonly omit the word "budget" to give widest connotation to the activity—is a product of the planning phase of management control. It is a rather complete road map and time table of how management's objectives are to be reached. The program describes in considerable detail the goals of the company, as well as the specific results which, if attained, will represent the fulfillment of these goals. Such a program, being tuned to the meeting of established targets, is treated as virtually inflexible during the annual period covered. Only in the instance of a major change in the company's operations, such as the purchase or sale of a major plant facility, would it be desirable to alter the year's program once it has been fixed.

It is a carefully constructed plan for the operation of the company covering virtually every phase of the business and presenting not only the figures and financial data which define the detailed plan but also, in narrative form, statements of specific objectives and goals for each unit of the organization, and the time and extent to which they are expected to be accomplished.

The programming operation may be applied to the company's anticipated activities over a long or short period. Our company has each year made a long-range program as well as the program for the coming year. However, control over the current year's operations is effected through the operation of the annual program. I shall describe the method used to produce an annual projection. It is not theoretical but a proven and workable system for the formulation of an overall company budget or program.

Theory of the Control Section

First, I should like to explain briefly just where the responsibility for this budget activity fits into our company's organizational structure. The programming function is one of the management controls which is operated in our com-

pany. It is also one of the controls for which the company's control or management section has been assigned responsibility for effective performance. This section is a small but separate unit of the organization, reporting to the president and working directly for him on those phases of management control which are his responsibility but which cannot possibly be handled by him alone. This need of the chief executive for assistance, for more hands, and eyes and ears, and hours per day is the basis for the concept of the control section. There are also similar control groups within the company's six operating divisions, which participate in the operation of management controls, including the budgeting functions, for the respective divisional general managers.

The determination of basic objectives for the business is considered to be a fundamental responsibility of top management. Before control can begin, we must set our sights on definite targets and then plan the means by which these goals can be reached. The determination of objectives and the recommendation of these objectives to the board of directors is the responsibility of the chief executive. In addition to the overall goals, it is important that each segment of the company have its own objectives. All objectives, first established on the basis of long-range thinking, must then be translated into terms of targets that are reasonably attainable over a single, annual program period. In the building of the detailed plans, the control section is the focal point. It is responsible for designing, scheduling, instigating, collecting, reviewing, publishing, and issuing the company program, and operates without the use of authority other than its position in the company organization.

Program Design and Scheduling

There are many details which may require consideration in working out the design of the budget. The number of factors is probably closely allied to its extent or scope. A cost budget for a small, independent activity would present few problems. When an overall or master budget covering many phases of a business is desired, the amount of planning is greatly increased. And this must again be enlarged if you are dealing with a multi-plant enterprise or a company engaged in several different fields of activity, such as our company. Determination of the program design includes the preparation of standard forms for the recording of programmed earnings statements, balance sheets and other financial data which must be consolidated to produce the company total program, after preparation on an individual basis by each of the operating divisions.

The arrangement of all financial data which will be requested of the divisions is reviewed in detail in order that it may be easily adapted for measurement

purposes in the monthly report. Also studied are reporting methods for such items as product sales details, production statistics, inventory breakdowns, and plant unit operating costs, which, for each of the several divisions, must follow different formats because of the individual natures of the businesses of each. In carrying out its responsibilities for budgeting and reporting, the control section must remain generally familiar with the accounting practices of the company and any changes of note are reviewed in order that programs may be designed as far as possible in conformance with the records, thus assuring reported data which is in conformity with established programs. A close relationship with the accounting unit is vital to the successful performance of these controls over operations. The cooperation we have received from our finance people has been a most important contributing factor toward the satisfactory experience we have had with this system of programming.

Following the development of the general design of the program, or, actually, prior to the completion of many detailed aspects of this first step, the second step is performed. This is the preparation of a time schedule which establishes due dates for each part of the programming job. This schedule covers dates for the completion of all major programming activities of the operating divisions, the staff departments and the control section. It includes the setting of specific dates for the control section to request the preparation of programs by other units, dates for their completion and submission, dates for review and approval by management committees, dates for the establishment of basic data on such matters as capital expenditures, and dates for the consolidation, editing, reproduction, final approval and issuance of the program. Exhibit 1 reproduces the schedule for our 1955 program in a condensed form, with the completion date for the entire program December 17, a few days prior to the scheduled meeting of the company operating committee.

Although programming activity starts as early as June 30, I do not want to create the impression that it requires extensive attention for nearly half of the year. The number of persons and the units taking part in programming increase through the summer months until the major effort and the final establishment of divisional sales and profit goals is performed in October and November. One major problem with respect to program scheduling has been to keep some of the units from fixing program goals and details without waiting for facts to become available in current conditions or experience. In more than one instance it has resulted in revisions.

There is a considerable difference among our six operating divisions in the time required and the effort applied to the making of budgets or programs. To some degree, this may be caused by the attitude or approach of the respective

KOPPERS COMPANY, INC.

Procedure and Schedule for Preparation of Program

(Condensed from schedule in chart form)

JUNE 30

Control unit requests research program from the research department, office management expense program from finance, salary pension expense allocation from the pension committee, the provisional capital expenditure program from the production staff, preliminary sales and profit estimates from each operating division, and the sales and economic forecasts from the company sales staff.

JULY 30

Control unit requests advertising, public relations, and dues, donations, etc. programs from the public relations department and the central staff expense programs from all staff units. Control unit receives the office management expense program from the finance department and the salary pension expense allocation from the pension committee.

AUGUST 30

Control unit receives the central staff expense programs from all staff units, preliminary sales and profit estimates from all operating divisions, and the sales forecasts from the company sales staff.

SEPTEMBER 14

Control unit receives the provisional capital expenditure program from the production staff and submits the central staff and office management expense programs to the appropriations committee. Meanwhile the dues, donations, etc. program is submitted to the appropriations committee by the public relations department.

SEPTEMBER 21

Control unit submits the central staff and office management expense programs to the operating committee and the public relations department does the same with dues, donations, etc. program. Meanwhile the control unit and the finance department jointly submit a trial cash source and application of funds statement to the president and the sales staff submits the economic forecast to the operating committee.

SEPTEMBER 28

The president sets the tentative sales and profit standards and the capital expenditure allocations.

OCTOBER 1

Control unit requests operating division programs from all divisions, the company general program from the finance department, and the central staff activity programs from all staff units.

OCTOBER 12

Control unit receives central staff activity programs from all staff units. Meanwhile the research and public relations departments, respectively submit the research and advertising and public relations programs to the appropriations committee.

OCTOBER 19

The research and public relations departments, respectively, submit the research and advertising and public relations programs to the operating committee.

OCTOBER 29

Control unit receives all operating division programs from the divisions.

NOVEMBER 12

Control unit submits the consolidated operating division program to the finance department.

NOVEMBER 22

Control unit receives the company financial program from the finance department.

DECEMBER 17

Control unit submits the complete program to the president for review by the operating committee and board of directors and for distribution following approval.

EXHIBIT 1

managements, some of which may have more readily grasped the values to be found in systematic planning operations, than have others. However, the separate natures of the businesses of our operating divisions are the major determinant in setting the amount of work required. For divisions which operate numerous small plants and produce a number of different products, a mass of details are necessary and a lot of coordination is required to fit together the budgets for each of their component units. From the standpoint of the control section, the time each unit starts is pretty much left up to the divisions, each of which has now been through the process of developing its program often enough to have a fairly well established procedure and timetable of its own.

Four Supplementary and Eleven Staff Group Budgets

The development of our annual program includes the preparation of four important supplementary budgets for which the primary coordinating responsibility is assigned to other units. Each of these separate programs is worked up in considerable detail and three of them are printed and published for the review and approval of management committees. The research department develops the company research program in cooperation with the operating divisions. This program outlines the objectives of research activity and the sum of money which is to be earmarked for the accomplishment of each objective. The public relations department is responsible for the preparation of an advertising and public relations budget and also for a budget or program of donations, dues and other similar services. These programs set forth the amounts proposed to be spent by each unit of the company for these services and describe both the objective sought and the results expected from these expenditures. The programs follow a well-defined pattern and an established procedure which outlines each step in their development. This is also true of the fourth supplementary budget, the capital expenditures program. In this instance, the production department staff perform the function of gathering together the recommendations of all company units, carefully screening and evaluating all items of magnitude, and summarizing these data in order that top management may weigh these needs against the availability of funds for carrying out the proposed program. The details of the capital expenditures program are not printed or formally released as a published program.

The preparation of these four programs ordinarily proceeds with a minimum of attention from the control section, except for the part it plays in setting the total availability of cash funds to meet capital expenditures, as touched on later. As indicated in Exhibit 1, the amounts of these programs are definitely fixed in

September or October for the ensuing program year, following their review and approval by two management committees. The next major operation is the development of the expense budgets for the company staff departments, such as law, finance, sales, traffic, procurement, and industrial relations. The control section actively coordinates the preparation of the programs for the eleven staff groups. The development of these budgets requires certain preliminary data, such as office space rental charges, company pension plan expense and office management service costs. Programs for each of these items are requested by the control section, secured, analyzed, and approved by management for inclusion in the departmental expense budgets. As indicated on the schedule, these departmental expense programs are fixed in September for the following year.

Pre-View of Divisional Sales and Profit Programs

A vital step in our programming procedure is the establishment of certain fundamental data on which the divisional sales and profit programs are based. Experience has demonstrated that it is necessary to work up a preview of the program in September in order to make certain that the final divisional programs, which will be received in November, will add up to an acceptable total program from the viewpoint of company management. In this preview, each division is asked to prepare an estimate of its expected sales volume and the resulting profit for the ensuing program year. The market research unit at this time likewise makes a forecast of general economic factors and their probable effect on the business of each division during the coming period. This economic forecast includes a projection of the sales volume which can be expected from each division, based on a continuation of known relationships between each unit's past operations and applicable economic indicators.

The divisional sales and profit forecasts are analyzed by the control section. They are also reviewed with the management of each division and discussed with company management in order that the general level of sales and profits may be rather definitely established and to make certain that the estimated sales and profit levels are set high enough to constitute realistic targets, reasonable of attainment. The divisional forecasts of sales and profits are likewise furnished to the finance department at this time and used, together with its estimates of general company expenses, anticipated working capital needs, and other financial data, to make a projection of the probable cash position during the program year. On the basis of this cash study, the level of capital expenditures to be programmed is set by management. By the first of October, the fundamental data on which to base the program is scheduled to be complete, with the re-

sult that we are virtually assured of a satisfactory, workable program when the details are all gathered in and consolidated in November.

How and When the Divisions Prepare Their Final Programs

About the beginning of October, the control section formally requests of each operating division the preparation of its final program. At this time forms are supplied for all financial data which must conform to a standard pattern, such as earnings statements and balance sheets. A specific request is made for each statement or set of data to be programmed. The list varies with each unit but generally includes statements of programmed sales by product in both quantities and dollars, production quantities, and plant earnings statements including cost details of such items as materials used, controllable plant costs, and fixed expenses. Detailed programs are also required for selling, general and administrative, research and development, and depreciation expenses. A complete balance sheet is secured from each division, with details of capital requests and expenditures and both quantitative and dollar inventories. All data is required on a monthly basis for the program year, together with certain projections for the last three months of the current year in order to tie in to the reported financial statements at the end of September.

Each division and each staff department is also asked to furnish a narrative statement describing the highlights of its program and specifically noting changes in operations, new activities, projected developments, objectives and plans for their attainment. The divisions are advised of the allocated amounts of such centrally programmed items as advertising, research, and staff departmental expense which must be included in their programs, as soon as these separate programs have been approved by the management committees. In addition, they are notified of their allocated portions of the total capital expenditures to be programmed. Departmental narrative programs are due about October 15 and all divisional program data at November 1.

While the process of developing all the details required to present the complete program of each operating unit varies with each unit, the general procedure is similar. In each case a projection of the expected sales is made by the sales personnel of the division. These sales programs for several divisions begin with an estimate by each salesman of the sales potential of his territory for the coming program year. Such forecasts are reviewed by sales area managements, by sales product managements and finally by division sales management. Division general management must, of course, approve the total sales program of the division.

After the sales goal has been set, the job passes to the production units to plan the operations of the division's plants to produce the required quantities of the desired products at the plants best situated to handle the business. This production step involves the planning of inventories of both raw materials and finished products. On the basis of fixed production goals, plant operating rates and personnel requirements are developed and a program of expected operating costs is made by each plant.

The sales and production programs are tied together by the division control group, which has also worked up programs for such overhead costs as selling and administrative expenses. The value of sales expected to be made by each plant coupled with the cost of production and the respective allocation of overhead, determine a profit goal for each plant and, in total, for the division. The programs of balance sheet data are generally prepared cooperatively by the division finance and control units.

Check and Consolidation of Programs

When the divisional programs are received by the control section, the peak of its programming activity is reached. Each program must be carefully analyzed, taking into consideration such matters as the record of past results, the rate of current activities, the desired accomplishments or objectives, and the reasonableness of attainment of the goals as set for the program period. Each program must be completely checked for mathematical accuracy and all supporting data checked for agreement with earnings statements and balance sheets. Final sales and sales expense programs are reviewed by the staff sales department. All allocated items are verified to insure conformance with subsidiary programs.

The control section then furnishes the finance department with earnings statements, balance sheets and cash source and application statements for each month, which are produced by adding together the programmed data from the six divisions. In the development of the consolidated program, the necessary financial transactions are projected by the finance department to provide cash in the amounts and at the times it is needed and to maintain adequate cash funds. Programmed working capital items are tested for adequacy in relation to past experience and expected sales volumes. Company management assists by establishing such items as dividend rates, proposed bank borrowings or stock sales, the expected rate of Federal income tax, and special items such as new investments or reserve requirements. When a satisfactory program has been determined, the finance department furnishes the control section with the consolidated programmed financial statements for each month.

Meanwhile, the job of editing and typing program data begins immediately upon receipt. The process of developing the staff department programs, received in October, departs far from the ordinary concept of budgeting and has required considerable effort of the control section with the staff department heads. In many instances we have found it difficult to fix targets and dates for the realization of specific objectives. The divisional programs are edited and typed as soon as they have been cleared with management, with this work continuing through the period when the finance department is working out the consolidated financial program. An effort is made to have the narrative describe all major factors bearing on each unit's planned activities and to set dates for the accomplishment of specific goals including such matters as sales development, product research, organization, training and labor relations. If all goes well, the departmental and divisional programs are substantially processed by the first of December.

Program Publication and Distribution; Progress Reports

The Koppers program is printed by the multilith process by our office services unit, the cooperative efforts of which are, at times, extended to the limit to help meet the scheduled publishing date. For the last couple of years, the printed annual programs have contained over 200 pages. It can be seen that a major amount of typing, proof reading, and reproduction work is involved. A typical program might include 35 pages for the company total program, 20 to 30 pages for each division, and about 70 pages for the section devoted to the staff departments. It has been the practice to include in the printed program essentially all of the program data which it is expected will be used for the measurement of monthly results.

Sufficient completed programs are assembled for distribution to the members of the company operating committee and the board of directors, which groups review the program at their December meetings. Following board approval, distribution of the printed program is made to members of the management group. Although all program material and printed programs are classified as "confidential," distribution of the program is encouraged to all management personnel who should benefit from its use. In general, these are the same individuals who receive copies of the monthly progress reports.

A major function of the control section—another one of the management controls for which this unit is responsible—is the publishing of these comprehensive monthly progress reports over-all and for each unit, dealing with all aspects of the company's operations. The entire emphasis is placed on the rela-

tionship of current operating results to the budgeted or programmed objectives, thereby focusing attention on today's results and their influence on tomorrow's business. Comparison with the results of past periods is largely eliminated because it is not believed that looking backward contributes greatly to moving forward. The progress reports, in relating accomplishments to fixed objectives, serve as a training medium in focusing attention on the benefits of realistic forecasting. Even though the members of the management team may appear to be "sold" on the virtues of the budget system, a major problem exists in getting individuals to set realistic objectives and annual targets for their divisions or departments to meet—not to just make conservative estimates of accomplishments which can be reached with most modest efforts. It is so easy for each manager to visualize all of the unfortunate circumstances which may come about and to provide for them, but it is much more difficult to give due account to the positive factors which may logically be expected to result from the application of intelligent management efforts. Regular, monthly use of the program for the measurement of progress has done much to "sell" management at all levels on the value of planning.

Essentials of Effective Programming

There are certain characteristics or requirements which are identified with almost any budgetary control activity if it is to serve as an effective tool for management control. Of cardinal importance is the attitude of top management. Its support must be active, not passive. If the budget tool is not used by top management, it will not likely be used to any great extent by lower levels of management. Budgets which are not used on a regular basis are not likely to be considered worth the effort required to be well prepared. It follows that a budget plan, without an adequate system for reporting progress against the programmed goals, will accomplish but little.

A satisfactory budget system also requires definite assignment of responsibility for the budget, preferably to an overall staff group. It requires the assignment of competent personnel who devote their time, not only to the formulation of the budget but also to the analysis of results in relation to expectations. The responsibility for carrying on these functions should also be clearly assigned within each of the major organizational units of the enterprise. Procedures should be developed which clearly describe the manner in which the budget is to be operated as a means of control.

Further, it seems urgent that, although the job of coordinating budget work is centralized in certain groups or persons, there be participation of all man-

agement levels in both the preparation and the following of the budget. The extent to which it is feasible to break down the total budget into a multitude of separate budgets—to individual goals for salesmen and specific projects for technical development personnel, for instance—may contribute much to the general acceptance and effective operation of the budget system. This is because each person who has a hand in the development of the budget has in effect committed himself to the attainment of specific accomplishments.

The timely formulation of any budget of extended scope appears to demand a carefully planned and coordinated schedule. In order to assure completion by a predetermined date to serve an established need, each of the many budgeting operations must be scheduled and followed for completion by its due date. All of the persons or units which contribute in any way to the total budget should be familiar with the schedule and realize the need for their compliance with it.

Of real value in the building of an overall budget, I would also include an arrangement for specialized aid to the group having general responsibility. Thus, an operation such as the evaluation of programmed sales goals in relation to anticipated general economic factors, may be well turned over to the market research unit. The help of the financial experts is definitely called for on some parts of the budget. Securing the assistance of other units may well extend to the delegation of primary responsibility for portions of the total budget, such as we have done with the research and capital expenditures budgets. The assistance of other staff groups should result in budgets in which management has more confidence—and thus in budgets which become more useful management controls.

Costing in the Commission Finishing of Textiles

by LAWRENCE B. KENNY

Chief Cost Accountant, The Apponaug Company, Apponaug, Rhode Island

Standard costs meet a job cost situation in the industry with which this article deals (as they do in other job cost lines). After indication of the manner in which the various classes of costs are charged and the way standards are arrived at, the author presents the outlines of, and reports resulting from, a cost review and presentation setup which keeps control of operations "in its sights" at all times.

IN SPITE OF THE GROWTH of many large vertical combines in the textile industry, which handle the product from the raw fiber to the finished article of apparel, a great proportion of the textile finishing work in this country is done by independent firms on a commission basis. These firms usually do work for jobbers or converters who purchase unbleached woven goods on the open market and have them finished on a commission basis. Finishing prices vary greatly, depending on the type of fabric and specifications of the converter. Because there is a wide range of fabrics which differ in fiber and construction, new processes are constantly being developed and the volume and type of business received each month fluctuates widely, accurate costs for pricing and control are of paramount importance to the success of the business.

The general term, finishing, includes bleaching, dyeing, printing and the imparting of a specified finish to the fabric. This finish may be for the purpose of making the material shrinkproof, waterproof, crease resistant, decorative or for any one of the large number of end uses. Dye-stuffs and printing materials vary greatly in price. Frequently two or more primary colors have to be carefully blended together to produce a customer's specified shade while, in other operations, all goods are sewn together in a continuous length for efficient operation. As can be imagined, these and other peculiarities of commission textile finishing present many cost problems. These we shall explore in this article.

Time Studied Standards for Labor Costs

Labor is measured and controlled through time studied standards. Standards include time for preparing the equipment for various types of goods as well as the operating time. Inasmuch as many of the operations, such as washing, drying, etc., are controlled by the weight of the cloth and since fewer yards of heavy

COST CARD

CLOTH #80-45
MEDIUM SPUN RAYON
WORK LOSS DATE 5/28
O/CR
PROCESS Dye, Vat, Indigosol, Naphthol
FINISH Tebilized
Anil Ind 14.646 Vat 15.454
Cup Nap 16.662 Wht
Dir Tub

MSR	LABOR & OVERHEAD	MAT	LABOR & OVERHEAD	MAT
S GREY	194			
H MACH)	-			
ROPE MALT)	799	250		
ROPE SCOUR)	-			
SS	110			
PAD BATCH	390			
PAD NIP	313			
DH AD	622			
WHT FR	359			
DYE	See Below Actual			
SF PREP	257			
DISP PA	131			
INV	208			
	6760	2810		
	2810			
W. L. 9.9% & 8.058	798			
Sales & Administration	690			
	11058			

MILL STYLE CUSTOMER

EXHIBIT 1

cloth can be put on a roll, standards for each operation are subdivided by cloth weight.

The Various Material Costs . . . and Their Handling

The materials used in bleaching, washing, and the various finishing operations are uniform and made up according to a laboratory formula. The same formula remains in use until a better one is developed. However, some adjustments have to be made in using these standard formulas for costing. First, a minimum amount of material is required in the machines to completely cover the cloth running through. When the last yard of cloth is run through, this minimum amount of material still remains. Although much progress has been made in redesigning the material tanks of the machinery to reduce this minimum and similar types of work are scheduled together whenever possible to spread the loss over more yardage, there is still a residue left which has to be accounted for. Also, in the handling of liquids, powders, and pastes, some loss due to adherence to containers, evaporation, and other unavoidable causes is bound to occur. To compensate for these losses in material, between the amount which is issued from the warehouse and that which gets into the product, nominal adjustments are built into the standards.

However, dyeing and printing materials do not lend themselves to standardization. There is an enormous range of shades possible in any one color. A slight change in shade might require an entirely different combination of primary colors each at a different price. Therefore, the job order type of cost sys-

COST COPY OF INVOICE

Customer — D-3-AN — Bill No. 1376
Your Lot 549 — Date 3/22
Our M. O. 2091

Cases	Description	Pieces	Yards	Price	Amount
		40			
LS					
32109	Perfects		2854-1/2	.13	$371.09
32111	Imperfects		151-1/2	.06-1/2	9.85
33724	Tebilised Perf. -2854-1/2			.07	199.82
	Tebilised Imp. - 151-1/2			.03-1/2	5.30
	D&R - 676-1/2			.01	6.77
	Sample - 1			.20	.20
	Total		3006		$593.03
	LS - 26			.22	5.72
	Paper - 28			.13	3.64
	Paper - 26			.08	2.08
	Reels - 28			152.95/M	4.28
	Tubes - 32			.13	2.16
	Straps - 3			.27	.81
	Cartons				6.00
	GRAND TOTAL				$619.72

Base 15.454	464.59
Royalty .500	15.03
Rehandle 10%	46.46
Print Time	
Color	
Dye	67.26
Loose Stock	6.16
Cartons & Straps	2.78
	602.30

EXHIBIT 2

tem is the only practical solution for costing and controlling the materials used in dyeing and printing. Duplicates of the formula records for each order are sent to the cost department where they are priced and the total cost posted to the individual orders. At month end, the total amount posted is checked against the amounts issued by the warehouse and the variances ascertained.

One of the peculiarities of this business is that many materials which are not a part of the finished product can be and should be charged directly to the product. Endless belt blankets on printing, sanforizing, and decatizing machines are expensive and have a measurable life. From information supplied by the manufacturers, coupled with past performance records, the anticipated number of yards attainable from a blanket can be established. The value of the blanket, divided by this figure, will result in a standard blanket cost per yard on the machines on which they are used. This direct charging is far more accurate for costing and control purposes then taking blanket costs as an overhead item and spreading them over all machines and products on an arbitrary basis, as is usually done with most supplies.

Because many items go into the formulas and some chemical prices fluctuate frequently though not widely, standard purchase prices are used. The variances from standard prices are charged to a purchase variance account. Standard purchase prices have many advantages in this industry. Chief among them are uniform material costs throughout the year, a saving in the clerical labor formerly spent in constantly refiguring formulas because of minor price changes, and a composite indication of the price trend through the medium of the balance in the purchase variance account.

THE APPONAUG COMPANY

PRINT VALUE AND PRODUCTION REPORT

Date 1/3

Start Patterns: New 2, Old 3 — No Rollers: New 6, Old 19

Mach. No.	Printer	M. O.	Customer	Patt	New Old	Roll	Const	Wgt	Patch Comb	Price	Prod.	Hours	Value	Est Yard
1	Jones	5000		89	0	10	72/44	1.50	5P, 3C	.22	4000	10.00	880.00	4,500
2	Smith	5010		61	0	6	80/80	4.00	2P, 2C	.12	12500	10.00	1500.00	12,000
3*	Johnson	5003		75	N	2	64/72	3.50	4P, 1C	.10	8000	10.00	800.00	10,000
4*	Moore	5006		81	N	4	80/80	4.00	3P, 2C	.1350	6000	10.00	810.00	8,000
5	Wilson	5019		96	0	3	112/60	4.11	4P, 4C	.09	15000	10.00	1350.00	15,000

*Customer Here.

	Value Per Hour	$106.80												
Totals:	Yards Per Hour	910									45,500	50.00	$5340.00	49,500

EXHIBIT 3

THE APPONAUG COMPANY

PRINT MACHINE DOWNTIME REPORT

Date: 1/3

Mach. No.	Change Pattern	Set Up	Patch Shade	Change Comb.	Reverse Rollers	Decision	Fix Color	Change Color	Wait Color	Lapping	Wash Ups Scrape Outs	File Doctor	Machine Repair	Engrav Repair	Cleaning	End of Day	Total	Remarks
1	125		115	110			15				25	10	50			15	445	
2		25	35	40					15							10	125	
3*	35		105		25	15	35	15			60			15		15	320	*Customer here
4*	55		95	35					45		45		85		10	15	385	" "
5	50		75	90												10	225	
Totals	265	25	425	275	25	15	50	15	60	-	130	10	115	15	10 - 65		1500	

Hours Apprentice ---
Hours Padding ---

Total Print Machine Hours 50.00
Total Hours Downtime 25.00

% Downtime 50.%

EXHIBIT 4

The overhead budget is set up on the basis of the expected volumes of the general classifications of work. These are established in conferences with the top management prior to the beginning of a new sales year. Overhead costs are broken into their fixed and variable components. Budgets are established for each operating and service department, as well as for the sales and administration divisions.

Steam and power costs form one of the largest single expenses in a finishing plant. Large quantities of hot water are required for washing the cloth thoroughly between operations to remove excess material. Steam is used at high temperatures extensively for drying operations. As a by-product of this situation, most finishing plants manufacture their own electric power. Steam, hot water, and electricity requirements are established from detailed surveys and estimates made by the engineering department. These are translated by the cost department to a cost basis for each cost center. Above a minimum amount for heating and standby operations, the fuel cost is a variable, while the other costs of the boiler house are fixed.

The remaining service departments include mechanical, warehouse, building service, and laboratory. Budgets are established for them based on the number of people and the expense required to give adequate service to the plant producing the projected sales volume. The engraving department, which engraves the customers' designs on copper rollers for printing, is treated as a separate business, because the customers are billed separately for engraving work.

Standard Cost Cards; Costing the Job Out

Additional overhead expenses, such as indirect labor, supplies, fringe benefits, etc., are calculated in the usual manner and charged to the producing departments. From the overhead rates in each cost center and the schedules of labor and material costs for the various operations in the factory standard cost cards are set up. In addition to all the standard cost components cited, a factor known as a "working loss" has to be added before the costs are complete. In finishing a piece of cloth, there is unavoidable loss from shrinkage and processing. This working loss differs with different fibers and finishes. The working loss percentage for each type of product is agreed upon by the finisher and converter after a pilot run and all subsequent orders carry the same allowance. The allowance is a part of the cost and has to be taken into account. For example, if six per cent is the working loss agreed upon the finisher will bill at full finishing price ninety-four yards for every one hundred yards sent to him by the

DIRECT AND INDIRECT LABOR REPORT

DEPARTMENT #1 BLEACH — WEEK ENDING 1/8

Process	Direct Labor Std.	Act.	Var.	Std. Speed	Actual Speed Net	Gross	Std. Cost/Hr.	Act. Cost/Hr.
1-A LAYOUT								
Heavy(Up to 3.00 Yds)	45.00			6000		6300		
Medium(3.00-5.00 Yds)	72.00			7500		7600		
Light(5.00 & Over)	33.00			10000		10100		
	150.00	140.00	10.00				1.50	1.50
1-B SEW								
Heavy	50.00			5000		4000		
Total Direct	810.00	795.00	15.00					

	Indirect Labor Bud.	Act.	Var.
1P Clerical	50.00	50.00	-
1R Supervision	75.00	75.00	-
1S Trucking	80.00	75.00	5.00
1T Cleaning	25.00	20.00	5.00
INDIRECT TOTAL	230.00	220.00	10.00
DEPARTMENT TOTAL	1040.00	1015.00	25.00

EXHIBIT 5

converter, i.e., the finisher has to process one hundred yards to get ninety-four yards which he can bill. Hence 6.4 per cent must be added to cost (per cent of six yards to 94 yards).

The cost cards (Exhibit 1) are prepared in advance, in full, except for the dye and print colors which, as explained, are charged at actual cost to the order. The cards are filed by process number and type of cloth. When an order is billed a duplicate of the bill is sent to the cost department. This bill is the authority for the order to be removed from the active file and costed. The cost is figured at standard on the bill copy (Exhibit 2). The color cost, which was previously posted on the order, is transferred to the bill for costing purposes. Extra charges for packaging materials, royalty, and an allowance for rehandling of the fabric are also included.

Reviewing Costs Extensively and Intensively

Orders on which a loss is shown are put aside for close analysis by the chief cost accountant. After the analysis has been made, a list of these losses, together with the reasons for them, is prepared and sent to the top management. All orders costed are posted to sheets classified by customer and type cloth. At month-end, a summary is made for top management, showing the profit from each customer and type of work. This is not all. Close control of costs is necessary in this highly competitive industry, with its wide fluctuation in volume.

SUMMARY OF PRODUCTION TIME LOST DUE TO MECHANICAL BREAKDOWNS

Four (4) Weeks - January 2 - 29, 1955

DEPARTMENT	MACHINE	Number of Breakdowns	Total Time Lost Due to breakdown
COTTON GREY, BLEACH & MERCERIZE			
#1	Mangle	5	7
	Bleach Frame	3	2
	Kiers	2	1-1/2

EXHIBIT 6

Accordingly, several cost control reports have been designed to meet the needs of management. The printing operation is the most expensive operation. Hence a daily Print Value and Production Report (Exhibit 3) and a Print Machine Downtime Report (Exhibit 4) are the most important single guideposts for management. Although they involve many calculations, we aim to have them typed and on the executives' desks by eleven o'clock of the morning following the operations involved. The print value and production report shows to the executives what work was printed the previous day as against the estimated production. The value of the work printed is a rule of thumb measurement of the selling value of the production of each machine. It is a very good barometer of the activity of the business and potential profit for the month. The print machine downtime report shows in detail the reasons why machines were stopped during the day.

All other labor in the operating departments is controlled through a weekly Direct and Indirect Labor Report (Exhibit 5). Production running through each operation is classified by the various weight categories. The yards run, multiplied by the standard rate per yard, show the standard amount earned. Also classified is the time the machine operated on each category of goods. The yards processed divided by the hours spent on the particular category, shows gross actual speed (or production), which can be easily compared with standard speed (or production). The total amount of money charged to the operation, divided by the total man hours charged to the machine, shows the actual cost per hour.

We find the report to be very useful in dealing with the foremen. They can easily understand their production in terms of yards per hour and they can easily put their finger on the category which is down in efficiency and take action to correct the situation. Also, if the standard in one category is not correct, it

shows up individually and can be adjusted if necessary. A comparison between the standard cost per hour and the actual cost per hour shows at a glance whether the foreman has been running with more or less than his standard crew. Indirect labor is also controlled on a flexible budget basis.

Another report which has recently come into use and seems to give promise of even more service as textile firms, like other manufacturers, approach the age of automation is the Summary of Production Time Lost Due to Mechanical Breakdowns (Exhibit 6). Each week a detailed record of each machine reported stopped due to a mechanical breakdown is sent to all top level executives. This report is an indicator to the maintenance department how to deploy its men efficiently. It also shows to top management where funds can be spent effectively to replace equipment which frequently breaks down in the middle of a busy season.

At month-end, a complete cost report of all expenses compared with standard is made from the factory ledger. The costs are analyzed by department and account. The variances are classified according to re-work, volume, and efficiency. In addition, notes are made of any special conditions. By this isolation of reasons for variances, management is enabled to know to what extent the sales and operating departments are responsible for profitable or unprofitable operations.

The Cost System Must Mirror the Industry

In this industry, realistic standards with proper allowances should be set if the foremen are going to be able to attain them and the company is not to be sold short in the market place. Also, standard costs should be used in the departments which are suited for them and actual or job order costs should be used for dyeing and printing where no better cost methods have so far been found. Commission textile finishing is a highly competitive and rapidly changing business with certain inherent characteristics which are different from other businesses. Accordingly, the cost system must be accurate, rapid and flexible. It must above all be based on the inherent characteristics of the business.

A Garment Factory Applies Direct Costing

by LOUIS W. BERGER

Controller, Pioneer Manufacturing Company, Inc., Wilkes-Barre, Pennsylvania

A brief study, the present case is, nevertheless, comprehensive, indicating pertinent conditions in garment manufacture and recounting how, in progress toward control, departmentalization for cost purposes was effected, a chart of accounts drawn up, direct costing and standard costs adopted as bases for the system, and control reports devised and issued.

IN OUR INDUSTRY, which is in desperate need of current cost and financial information, there is widespread disregard of the value that the proper accounting methods have given to all other segments of American business. (There are a few isolated exceptions and these companies have guarded their secrets with the zeal of nuclear physicists.) As a result, the use of cost accounting in almost any form is difficult to find in a dress, coat, suit, or blouse factory. Nevertheless, in some aspects, garment manufacturers are way ahead of other industries. This is evident in the recognition given to the value of styling in creating markets—an accepted fact when every automobile was painted black and all kitchen equipment was white. In most garment plants, styling is completely changed three or four times a year. Yet this particular progressive feature, in itself, should make it imperative that adequate cost control be established, because of the need for quick decisions and an all inclusive plan with profit goals. To illustrate, after our costing method had been established and we had collected enough information, allowable costs were given to our designing department for a guide. This lets the designers know the amount of money they can spend in the various style ranges for the direct costs related to piece goods, trimmings, sewing labor, and finishing labor—fundamentally the only ones controlled by the styling. After the designing department submits the new styles to the factory, each style is completely pre-costed by our Engineering department. This includes the amount of piece goods and trimmings to be used and also serves to set the sewing and finishing labor and rates by styles. Standards are determined for each style.

Departmentalization — and Direct Costing

We decided to use the direct costing method because of the great fluctuations in the productive cycle in this most seasonal of all businesses. With the direct

costing principle in mind, the company was divided into departments and a new chart of accounts adopted, as follows:

Departments	Accounts
General and administrative	**Balance sheet accounts**
Executive	100 Current assets
Accounting	130 Inventories
Production control	140 Deferred charges and other assets
Engineering	160 Fixed assets
Personnel	200 Current liabilities
Sample	250 Reserves
Sales	280 Fixed liabilities
	300 Net worth
Direct Factory	
Piece-goods	**Operating accounts**
Bias	500 Sales
Cutting	510 Sales returns and allowances
Sewing	520 Sales discounts
Finishing	550 Raw materials
Shipping	570 Direct labor
Factory service	**Operating accounts**
Plant administration	580 Contract labor
Receiving	600 Indirect labor
Mechanical	700 Expenses
Building maintenance	800 Financial income
Cafeteria	810 Financial expense

All expenses are charged directly to the department incurring the expense. In the direct factory departments, only the direct labor and the variable indirect labor are charged to the product and go into inventory. The salaries of top supervision in these departments are fixed and are, therefore, charged off on a calendar month basis. Our factory service departments have indirect labor which is semi-fixed and is also charged off on time basis. All other overhead and fixed expenses in the general and administrative, direct factory and factory service departments are charged to operations monthly and do not go into inventory.

By use of the direct costing method, we are in a position to indicate to management the advisability of accepting orders in certain periods of the year, which will not give the usual gross profit per cent, in order to obtain the advantages of doing some business

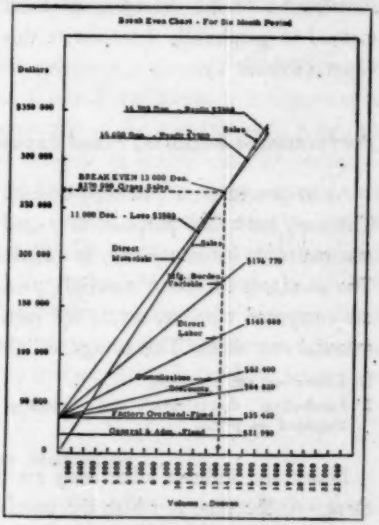

EXHIBIT 1

CUTTING ORDER

Style-Lot	Prod. Ord. Date	Prod. Amt.	Date Auth.	Dos. Auth.	Doz. Cut	Contractor 3107	
WTG 1571 B			11/23	12.4			
Case	Color-Shade	Type	Vendor	Yards Per Doz.	Yds. Iss	Actual Price	Cost
Body	White	Nylon	47/48	11,989	1487+2	.50	744.50
Trim	76 Firebird Red Zeset			13,834	1052+6	.40	423.20
	48 Seafoam				665+2	.20	133.40

					Estimate Yards	Cost
Piece Goods Per Doz.			25,823	3204		
Total Piece Goods	Variance Yds.	$ 11.10			1301.10	1290.00

Trimmings	Item	Description	Actual Amt.	Actual Price	Actual Cost	Estimate Amt.	Estimate Cost
				123.00	123.00		
Trimmings Per Doz.		Variance			123.00		130.00
Total Trimmings		7.00			123.00		130.00
Direct Materials Per Dozen							
Direct Materials Total		4.10			1424.10		1420.00

EXHIBIT 2

which may contribute only partly to the carrying of fixed expenses. These advantages are primarily due to the tremendous swings in the production cycle and the long periods for which the plants might be idle, during which some contribution to the defraying of fixed costs is better than nothing. A good method to graphically demonstrate this to management is to use a Break Even Chart (Exhibit 1).

Performance Reports; Fixed Expense Budgets; Operating Statements

As to procedure, a cost copy of each Cutting Order (Exhibit 2) is prepared. This copy has a dual purpose. It is used as a requisition to make deductions from raw materials inventory and, in addition, as a cost sheet for all direct material. The standards for direct materials, piece goods, trimmings, and packing supplies are compared with the actual for each style and lot as reported on the direct material cost sheet. This brings to light these differences, where they exist:

1. Estimating not accurate.
2. Purchasing department not meeting standard on price.
3. Markers not being made economically (blue print for each style).
4. Errors in manufacturing requiring additional raw material.

Direct and indirect labor costs are collected by sections within each department. At the time at which the standards are prepared by the engineering department, the quantity which will be manufactured is multiplied by the stand-

ard cost for each style. This gives a weighted average which becomes the actual standard labor cost for each department. This unorthodox approach saves us considerable time and can be used in our particular business with enough accuracy to satisfy the operating people. Some garment plants will be able to use this method and some will have to charge out styles by the standards set.

Weekly reports on Direct and Indirect Labor Cost (Exhibit 3) are prepared. These are compared with the standard for the departments established by the engineering department, as already noted. Actual labor figures are discussed with the supervisors and foremen and the weak sections are highlighted. Where such weaknesses as excessive "make up" charges are exposed, special reports are prepared to help correct the condition. However, a conscientious effort is made not to incorporate these in our regular reports. As an example, in departments not meeting the standard, special reports will be prepared to indicate amounts of make up by individual workers and sub-sections and to show also excessive overtime premiums. However, these reports are continued only until the condition is rectified.

For all fixed expenses, departmental budgets are prepared on a six-month basis, with the foreman's or supervisor's assistance. These budgets are changed when major policy changes occur affecting them. In conjunction with the monthly operating statements, complete departmental expense statements are prepared. The department head receives a copy of his statement, which shows a comparison with the budget. All variances must be explained by the department head.

Because the individual installing a cost system in a garment plant will probably be the one to prepare operating and financial statements, it is important to know how this system helps in the preparation of these statements. Although it is not necessary to keep detailed work-in-process inventories, raw materials and finished goods inventories should be kept. From the direct material cost sheet, deductions are made from the raw materials inventory and charged to work-in-process. From the payroll entries, work-in-process is charged for direct and indirect labor. The credit to work-in-process and the charge to finished goods is made by using the finished goods report in conjunction with the direct material cost sheet and labor analysis. Inasmuch as all fixed expenses are charged off on a monthly basis and do not go into inventory, we do not have to concern ourselves with applying burden to the product.

The Sort of Information Needed for Managing

What does this system do for the manufacturer? Basically it gives him direction, with frequent signposts to make sure that he reaches the goal established

DIRECT AND INDIRECT LABOR COST

Section No. - Name	Dept. No. - Name	Season	Date Started
52 - Auxiliary	50 - Sewing	Spring std. (.80)	11/29/ std. (.09)

	Current Week				Season To Date*				
	Direct Labor		Indr. Labor		Direct Labor			Indirect Labor	
	Prod. Dos.	Total $	Per Dos.	Total $	Per Dos.	Prod. Dos.	Total $	Per Dos.	Total $	Per Dos.
11/29	2500	2000	80	250	10	2500	2000	80	250	10
12/5	3162	2561	81	285	09	5662	4561	81	535	10

*Complete formulas year-to-date columns also.

EXHIBIT 3

and does not lose his way en route. This statement will take on further meaning if the following recapitulation of features of the system is read thoughtfully:

1. What can we put into a dress? This is the allowable maximum for direct material and labor, furnished by the accounting department to the designing department.
2. How did the designing department perform? The pre-costs established by the engineering department indicate whether or not the designing department has performed efficiently and has designed a line that will be profitable.
3. Are our direct material and labor standards accurate? These are established by the engineering department.
4. How is the factory performing? Compare direct material cost sheet with pre-cost. Compare weekly labor with pre-cost. These comparisons will let us know how our operating departments are performing.
5. Did we purchase at price estimated? Comparisons of direct material cost with pre-cost will indicate performance of purchasing department.
6. Are fixed expenses in line? Compare the monthly expense statements with the budget.
7. How much does it cost to operate this system? There should be very little additional clerical help required. It is just a realignment of the usual existing records.

Through our system, surprises inherent in a garment business and which management fears, are held to a minimum. Every step of the manufacturing cycle is given direction and held to conform to management plans. Consequently, viewing the operating statement should not be a traumatic experience for top management.

It often happens in a soft goods manufacturing enterprise, that the chief financial as well as cost man is the public accountant retained by the company. I have found in garment plants that he is sometimes the first obstacle to be overcome in instituting a cost program. Because his forte is auditing and taxation, he will usually tend not to see the advantages to be derived from cost accounting. There are also other hurdles. In presenting a cost program to management, it must be outlined as to methods and advantages, and this outline must indicate the eventual goals and show how the system provides for the attainment of this goal. Above all, the system must be kept simple, because of

the constant seasonal changes in style and the limited amount of money which can be allocated for cost accounting in the soft goods industry. In this connection special cost studies should not be incorporated in the system. These studies should be performed when a weakness develops and discontinued when it has been rectified.

The information supplied by a garment industry cost system (as in other industries) must be current. Late information is useless, since all the styles and seasons may change before the information gets to the department and management. Nevertheless, a good system is invaluable to good management. We have found that our system of accounting for control has also been a great help in cost cutting programs. It exposes the weak points and indicates places for savings in both the fixed and variable areas of cost.

The Appeal of Direct Costing in a Bakery Operation

by FRANCES W. STURGEON
Treasurer, Rice's Bakery, Baltimore Maryland

The educational and developmental aspects of the profit improvement program here described, against a distinctively baking company background, relies heavily on the understandability of direct costing (and break-even analysis!) and on loyalty of operating men to standards they have shared in setting. Control of selling efforts is given attention at least equal to that accorded production.

OUR COMPANY WAS STARTED in 1868 in a little one-room shop and, through the years, has grown until it now owns about three-fourths of a city block. Good accounting has become more and more needed. However we have had difficulty in our efforts to get our accounting used as a tool for management. When we switched our approach to giving people the information they needed in terms they could understand, rather than in accounting terms, we began to have increased success. We sell primarily through our home service division, which operates 223 house-to-house routes in Maryland and Delaware. This branch of the business accounts for about seventy-five per cent of our sales. We have a wholesale division which sells to restaurants and institutions, a bake-shop division with fourteen stores throughout the city, and three surplus stores which sell, at a reduced price, the overproduction and "cripples" from the production departments, as well as the products returned on the previous day by the other three divisions. (None of our routes or bake shops carry goods the second day.) In a 30-hour period, Rice's manufactures and sells approximately seventy-four varieties of bread, rolls, sweet goods, pie and cake, with about 119 varieties available in any one week. We have over six-hundred people in our employ, about sixty of whom are in supervision.

The office force, which is directly responsible for the cost and budget work, is also responsible for the general books, accounts payable, accounting for production, and most of the purchasing of raw materials. In fact, all of the accounting except the sales accounting, plus quite a bit of typing and some stenographic work, is carried out by this staff. There is an office manager in charge, with four girls working with her. It should be clear that it is an excellent group of girls and that they do a splendid job. However, with this small group to do the accounting and with varying levels of training among the members of our super-

visory group, it can be understood why it has been necessary to keep our system simple.

Clarifying Effect of the Direct Cost Approach

Application of direct costing has been one of the most important factors in making this possible. This method differs from conventional standard costing, in that it charges to the product only the variable cost connected with the manufacture of it. The manufacturing expenses for the period are charged directly to cost of sales. Direct costing is very easy for a production foreman to understand. He can see that it should take a certain amount of material, labor and wrapping supplies to produce a given quantity of products and he can understand that repairs in his department should cost a certain amount, i.e., that he is allowed so much for cleaning and other items in the list of his manufacturing expenses. This makes sense to him. But adding .001 to the cost of a louisiana ring cake to cover the cost of electricity did not. He couldn't see these expenses as part of product cost.

Classes with Production Men

When we started direct costing, we decided that we must have some kind of an educational program, so that the people would know what we were talking about and what they would be responsible for. We broke our income and expense statement down into twelve areas of responsibility and planned to give direct cost statements to each of the supervisors in charge of these twelve divisions. We wanted to train these twelve, plus the individuals who would be working with them, in the use of the statements and, at the same time, give them some understanding of the economics of the baking industry. For these purposes, we organized small classes and started at the top. (The first group was what we call the management group: chairman of the board, president, vice-president and production, sales and personnel managers. Although this was the highest-level group, only two of them were familiar with accounting so we used the same plan with them that we wanted to use with the rest of the supervision. Moreover, this was the group of people on whom the success of the whole program relied. In fact, it would have to be their program if it were to be successful. So it was imperative that they should thoroughly understand what we would be doing.)

We began with "Why must we make a profit?" and "What is profit?" and worked from that into "What do we have to do to make a profit in this busi-

ness?" We wanted to get away from the concept of profit being only for the stockholders. We were going to specifically ask the people to work to make a profit which was a more than slightly different slant from the old concept of work to get sales or get out production—and we wanted to be sure they understood how making a profit would benefit them. The sessions were conducted on a group participation basis with the author, as company treasurer, acting as moderator.

When we had established the reasons for making a profit, such as expansion of business, job security, increased employee benefits, payments to stockholders, and replacement of equipment in a rising market, etc., those present could understand profits as something very important to them as individuals. We then went into the nature of profit. We made that easy—whatever is left after you pay all your bills. Then came the hard part, the question what we have to do to make more profit in the baking business. The answer given was that the objective is to increase sales so that you have more than enough money to pay expenses. It was then pointed out that our sales had been increasing, but we were not making any more profit.

That naturally led into the question of expenses or costs. We got the members of the group to mention all the costs they could think of (and they thought of all of them) and, as they named them, the moderator wrote them on the board, entering them in different columns: production variable, production overhead, sales variable, sales overhead, and administrative (without heading the columns). After listing all the costs, we picked out the ones for which the members of the particular group present were responsible and discussed them, especially as to the similarity of the costs as grouped and as to what made these costs increase or decrease. This led into recognition of the variable and nonvariable aspects of cost. We ignored the semi-variable classification. At the present time, we feel that it is not important enough in our business to make the segregation, from the standpoint of the work involved, and that these costs are very difficult for the supervisors to understand. Oven costs were the ones we had the most discussion on in the production group and, although they are certainly more variable than non-variable, we decided that, because the ovens could never be allowed to get cold, we could consider them as a cost of doing business. The ovens are not individually metered and getting an accurate variable cost would have been impossible.

Our variable production costs are material, wrapping, direct labor (and the fringe payments applicable to the direct labor). All other manufacturing expenses, including the cost of production cripples, are considered nonvariable

costs. Segregating the variable and nonvariable in this way and considering the variable cost as product cost, takes all of the mystery out of accounting figures. They become easily demonstrated facts. The variable costs should have a constant relationship to production and the non-variable costs should be a definite dollar figure. When we finished the class with the production departments, the group understood that the product cost should vary directly with the amount produced and that department personnel should do everything in their power to control the manufacturing expenses, because every dollar spent unnecessarily was a dollar out of profit.

Classes with Sales Supervisors and Salesmen

The classes with the sales divisions were even more illuminating because those groups are each responsible for a complete income and expense statement. We took each of these groups through the same steps as the other groups: why we must make a profit, what profit is, what we have to do to make a profit in this business, and what the various items of cost are. Our salesmen and district sales managers are paid on a commission basis, so that product cost and commissions are the sales variable costs. We explained to them that they were being charged only for the material, wrapping and direct labor on the products they order. They readily accepted the fact that those costs should vary directly with the order. There was, of course, no problem about the variability of the commissions. They have been paid that way for years so they know all about the variability of commissions with sales!

Then we started on what sales personnel could do to make a profit. A forty-five percent variable product cost and a twenty-five percent variable selling cost are considered standard in the house-to-house branch of the baking business, so we used these figures for our variable costs, which gives a variable cost of seventy percent and marginal profit of thirty percent. The next question naturally is, "What does this thirty cents out of each dollar of sales have to pay for?" We established that it had to pay all selling expenses, except commissions and those we called direct operating expenses because the sales division is responsible for the amount spent. The marginal profit had to pay for all of the manufacturing and administrative costs and those we called indirect operating expenses because the sales department had no control over the amount. In addition, there had to be enough of these thirty cents so that there was a profit after the direct and indirect expenses had been paid for. The concept we tried to get across was that seventy cents out of every sales dollar is used up as soon as the sale is made and that we have only thirty cents left. Therefore we must not only have high

RICE'S BAKERY

OPERATING STATEMENT CAPTIONS

Available at Retail Sales Value
Less:
Surplus
Damaged, Donations, etc.
Total Shrink
Sales
Variable Costs
Sales Costs:
Salesmen's Commissions
District Managers' Commissions
Employee Insurance Costs
Total
Product Cost
Total Variable Costs
Marginal Profit
Direct Operating Expenses
Selling Expenses
Branch Operating Expenses
Delivery Expenses
Transport Truck Expenses
Sales Promotion
Total Direct Expenses
Location Cash Profit or (loss)
Less Indirect Operating Expenses
Operating Profit or (Loss)
Collections
Number of New Employees
Number of EOD Routes at end of period
Number of 5-Day Routes at end of period
Customers at end of period
Quits during Period
Bread Units per Customer
Sales per Customer
Average Weekly Surplus
Credits at end of period:
Slows
Inactives
Average Weekly Miles
Operating Statement
Branch Selling Expenses
Manager's Salary & Expense
Pivot Men's Salaries
Junior Salesmen's Salaries
Total Salaries
Employee Benefits
Employment Expense
Uniform Expense
Hamper and Basket Expense
Bad Debts
Miscellaneous
Total Branch Selling Expenses
Branch Operating Expenses
Porters and Packers Wages
Transport Truckmen Wages
Clerical Wages
Total Wages
Employee Benefits
Clerical Expense
Telephone
Repairs to Building & Equipment
Building & Equipment Depreciation
Fire Insurance
Taxes - Real & Personal Property
Heat, Light & Power
Supplies
Miscellaneous
Total Branch Operating Expenses
Branch Selling & Operating Expenses

EXHIBIT 1

sales volume in order to get enough of these 30 cents—but we must keep our operating expenses under control so that there will be a profit.

We gave each of the supervisors blank copies of the operating statements (captions shown in Exhibit 1—in practice a single column flanked by two money columns) and then proceeded to take many hypothetical cases in terms of suggested figures and work out a profit and loss under various conditions, to see what effect changes in sales or expenses had on profit. We taught them how to figure the amount of sales needed at a thirty percent margin to cover varying operating expenses. We worked out what sales we would have to have to break even or maintain our profit if the variable costs per unit went up and the marginal profit was decreased. We got the supervisors to understand that they

would not make a cent of profit in any period until they had made enough sales to cover all direct and indirect operating expenses.

Once we had these facts pretty well established, we started on a few more complicated things. These included sales which would yield forty-three cents on the dollar or seventy-five cents on the dollar and things which could be done which would have the effect of adding a dollar in the profit column. Exhibit 2 shows the sort of hypotheses handled. Some of the men were fascinated with this. It was the first time they had ever felt that they had any responsibility for anything other than sales and they certainly never knew the tremendous effect their performance could have on profits. It floored them to realize that it required over three dollars extra sales for each dollar of extra expense. Much of what we talked about has probably been forgotten by now, but two basic things have stayed with these individuals—their responsibility for profit and the need to control expenses. We had never been able to accomplish even this much before and I believe the main reason we were successful this time was that all attending the meetings could understand the figures in the manner presented. Direct costing or marginal costing made sense to them.

How Underlying Standards — and Controls — Are Shaping Up

The breakdown of the income and expense statements into areas of responsibility and the educational program on the economics of the baking business was the first step in the introduction of our profit plan (or budget, if you wish to call it that). Such a plan is much needed in our line. The food industry is a very low-profit industry. I believe the average profit is about five percent on sales. The bakery section of the food industry shows an even lower figure. It averages about three percent return. In order to make sure of our profit level, we feel that we must develop a profit plan which will be acceptable to the people who will have to make it work. The only way we know to do this is, first, to get the individuals to the point at which they want a profit plan and, second, to get them to develop the standards and types of controls needed to make it work. We have pretty well accomplished the first objective. It was a long, slow process, but well worth the effort because we feel we have eliminated the chief cause for failure in budget operation, i.e., that the people who must make it work, do not want it.

We are now in the process of developing standards and controls. This, too,

EFFECTS OF ALTERNATIVES TO IMPROVE PROFIT

(Starting point: Break-even sales)

	Break-even Sales	Increase sales 10%	Decrease order to decrease surplus*	Increase sales to decrease surplus*	Decrease profit by increase in direct or indirect expense	Sales Required to offset increase in expense
Taken out	$104,600	$114,600	$102,000	$104,600	$104,600	$107,933
Surplus*	4,600	4,600	2,000	2,000	4,600	4,600
Sold	$100,000	$110,000	$100,000	$102,600	$100,000	$103,333
Variable sales cost	$25,000	$27,500	$ 25,000	$ 25,650	$ 25,000	$25,833
Variable product cost	45,000	49,500	43,880	45,000	45,000	46,500
Total variable cost	$70,000	$77,000	$68,880	$70,650	$70,000	$72,333
Marginal profit	$30,000	$33,000	$31,120	$31,950	$30,000	$31,000
Direct and indirect expenses	30,000	30,000	30,000	30,000	31,000	31,000
Profit	-0-	$3,000	$1,120	$1,950	($1,000)	-0-
Increase in sales		$10,000	-	-	-	$3,333
Decrease in shrink		-	$2,600	$2,600	-	to
Increase in expense		-	-	-	$1,000	offset
Increase in profit		$3,000	$1,120	$1,950	($1,000)	$1,000
Increase in profit per $		30¢	43¢	75¢	($1.00)	in- crease in exp.

*Means goods unsold at end of first day.

EXHIBIT 2

is slow because we are having the supervisors set the standards, based on past experience, or performance which they feel is attainable. We know that these will not be engineered standards and that, in the first attempt, some of them will not be as accurate as we would like, but this is not important right now, because our objective is to get supervisors interested in controls and meeting at least some standard performance. The accounting department does act in an advisory capacity in setting the standards, so that we can be sure they will call for as good, or better, performance than we now have. We are attempting to keep these standards and controls as simple as possible, for two reasons. We want them easily understood so that they will be acceptable and we want to keep the work necessary for the record keeping and reporting at a minimum and still be able to develop all the information needed for control.

We are just getting into this phase of our profit plan but, by the end of this year we expect to have most of our expenses covered. We have a material and wrapping control program functioning, although it is over-all and not detailed. Inasmuch as, on this basis, the outlay has been within five percent of standard, we are not going to put forth too much effort this year to get it on a product

basis. When we do go that far, we will do it in a relatively simple manner, as in other instances. Each production department will be given a daily report of ingredients used, for comparison with products made. The task given these departments will be to record production and to account for any differences. We have also set up standards on indirect labor, again in total, i.e., dollars of payroll. However, we are controlling this through the quantitative data: number of people and hours of work. As we get into further refinements, we hope to get some of the individual indirect labor jobs on standards of performance.

Our big immediate task is control of direct labor. We have had labor standards set for us at least twice by outside management consultants, but we could not get them into use. This time we are taking a different approach. The production supervisors are to set their own standards and establish their own control requirements. At present writing, they have completed their standards, which are in terms of units of a product which can be made in a minute and the crew size required to maintain production at this rate. (When the standards were stated in terms of taking, say .8 minutes to ice a cake, they had no faith in them and would not try to make them work, but now that they have said, themselves, that four girls can ice five cakes a minute, they can hardly wait to get started to prove that it can be done.)

The method seems sure to work. The line of progress is to take one product at a time and get that moving through the shop on the schedule (or standard) established for it. When that one is working satisfactorily, the next product will be set up in the same way and so on until the production is all on a scheduled basis. It will probably take the greater part of a year to get the shops completely scheduled, but this is the hardest job we have to do. When this is completed, it will be relatively easy to get the remainder of the controls into the shops and on a daily or weekly performance basis.

In past years, our sales projection has been stated in terms of dollars of sales expected from each division. It was impossible, without an excessive amount of clerical work, to break this figure down to a short term route performance for which a man could be held responsible. This year we are setting route standards in terms of customer count and bread units, with goals being set with the salesman every four weeks. We know what our customer count and bread units must be to reach the desired sales figure and, by setting up the control in these terms and holding the salesman accountable for his performance, we will be able to attain the figure budgeted. Controls by salesmen have also been established this year for customer credit outstanding and dollars of surplus goods (returns) allowed in a week.

Learn-as-you Go

It will have become clear that planning has been thoroughly established. Although we have a plan and know what we want to accomplish, we are definitely on a learn-as-you-go basis as to how we are going to do it. One thing we have learned over the years is that people put forth their best efforts when they are doing what they want to do in the way they want to do it. We have geared our improvements to the process of finding out how employees can operate best and are changing our methods to suit their needs. We are setting an example of cooperation and are inspiring the same characteristic throughout the company.

Daily Control Figures for Labor and Material

by ARTHUR C. BROWN

Financial Division Manager, Pneumafil Corp., Charlotte, N. C.

The concern of this article is the availability and use of reliable daily figures in a small manufacturing operation, reflecting labor efficiency in detail and disclosing position in critical materials. Bookkeeping machines are used in the preparation of intermediate records and of reports, several of which are described and two of which are illustrated.

THE ROWE FURNITURE COMPANY is one of those which might be termed "of an awkward size" — too small to afford the luxury of electronic data processing or even a full-scale punched card installation and yet too large to be run on the basis of visual control and the individual judgment of the operating supervisors. The plant is a mass producer of upholstered living room furniture. In order to solve the cost and inventory control problems, the company has developed some relatively simple and inexpensive controls through the medium of timely reporting.

The company has a wage incentive plan in which most of the productive labor is paid on a piecework basis. Although the labor cost is controlled to a large degree by the piecework system, the absorption of fixed and overhead costs is directly affected by the efficiency of the workers. Naturally profits are also directly influenced by this relationship. In order to control the productivity of the individual worker, we have adopted a system of daily reporting. The daily analysis is made in hours only. It has been our experience that quantitative factors and time relationships are better understood and appreciated at the plant level than comparisons and statistics in dollars and cents.

Each day a complete analysis of direct and indirect labor is made for the previous day in the form of a flash report called Daily Labor Analysis (Exhibit 1). These flash reports are prepared in triplicate and are grouped by productive departments. The distribution of the flash report is to the superintendent, department supervisor and industrial engineer. The department supervisor's copy is shown to the workers in each productive department or cost center. The main feature of the report is an efficiency rating for each productive piece-rate worker. This class of direct labor represents more than eighty per cent of the total direct labor. In addition, all nonproductive work, or indirect labor, is classified and shown for each worker in the plant. The few productive workers

who are not on piecework rates are listed as though their work were non-productive or indirect.

The flash reports are prepared as a by-product of posting each worker's daily activity to a weekly wage accrual card. Totals in hours are shown for all classes of work for each department, so that the report will also give a comprehensive picture of the departmental activity. In addition to the overall department report, a further efficiency and production report is prepared each day for each assembly line. Inasmuch as the prepartion of the efficiency and production reports is a by-product of posting the individual wage accrual cards, a fast and simple operation, the cost of obtaining these valuable reports on a daily basis is negligible.

The results which have been obtained from the method of reporting adopted have been very gratifying. The morale of the workers has improved as a result of keeping them informed of their individual progress. Any errors in the accumulation of earned time, which would formerly have gone undetected in the weekly average, are now detected by the workers and the supervisors daily as they occur. The opportunity thus provided to correct these errors before the weekly pay checks are written has resulted in considerable savings in clerical time. The production supervisors and engineers now have a sound basis on which to progressively judge efficiency when it is still news and not history. It has been possible for them to take corrective action while the related facts and conditions were still fresh in the minds

DAILY LABOR ANALYSIS

Date	Clock No.	Hours Worked	Description	Hours Code	Description	Hours Worked	Hours Earned	Variance Hours	Variance Percent	Name	Leadmen	Inspect. & Cleaning	Dispatch	Repairs	Change-Over	Other	Total
			Dept. 1														
Jan 28	51	8.00				8.00-	9.55	1.55	119.30	J.R.							
Jan 28	52	7.75	NW	2.790	.25	5.00-	5.64	.64	107.40	R.B.							
		15.75				.00	15.19	-.00			.00	.00	2.75	.00	.00	.00	2.75
			Dept. 3														
Jan 28	101	8.00				8.00-	9.03	1.03	112.80	L.M.							
Jan 28	102	8.00				8.00-	10.40	2.40	130.00	R.K.							
Jan 28	104	8.00				8.00-	9.50	1.50	118.70	C.P.							
Jan 28	105	8.00				8.00-	8.28	.28	103.50	I.W.							
Jan 28	106	8.00				8.00-	5.31	2.69CR	66.80	S.M.							
Jan 28	107	8.00				8.00-	10.01	2.01	125.10	H.L.							
Jan 28	109	8.00				8.00-	8.16	.16	102.00	W.M.							
		56.00				.00	60.73	-.00			.00	.00	.00	.00	.00	.00	.00

EXHIBIT 1

of all concerned. However, by far the most important benefit which has accrued to both the workers and the company is that efficiency has improved as a direct result of these reports, with a corresponding increase in earnings and operating profits.

In the detailed content of the report there is shown for each worker total hours worked, nonproductive hours worked by classification, productive hours worked, productive hours earned, variance from the standard allowed time in hours, and percentage of the standard allowed time realized. Departmental totals for each class of work are produced automatically as a by-product of processing the work, through the selective keyboard feature of the accounting machine which we use. Five categories of the nonproductive work represent about ninety per cent of the nonproductive total. Departmental totals are obtained for each of these five classifications, which are: leadmen, dispatch, inspection and cleaning, repairs, and changeover. When any other type of nonproductive work occurs it is described on the records and on the daily reports for analyses purposes.

Control of Material Position

Some raw materials are more critical than others, in their nature and importance, in nearly all manufacturing operations and this is true in our company. Our most critical item of raw material is upholstery cover cloth, for which we have installed special controls. Similar controls are applicable to other materials having the same characteristics.

Our major materials problem is to provide sufficient quantities of the right cover cloth in time to meet production schedules, without overstocking any particular pattern or color. Inasmuch as our business is one which is affected by style and pattern changes, the worst hazard from overstocking is the possibility of obsolescence, necessitating the liquidation of overstocked items at drastic reductions and consequent loss. A further hazard of overstocking is that, even though the overstocked styles may not be outmoded, they will nevertheless, limit the variety of the production and retard or reduce the sales potential to below the budgeted level, creating idle time and facilities.

The first element of control is the data needed by the purchasing department to "keep the pipe line full." Each day, the in-coming sales orders are tabulated on our accounting machine to determine the yards of cover cloth of each pattern-color combination required to produce the furniture ordered. The cover number involved may be any of three hundred and fifty different pattern-color combinations to cover any of more than one hundred different pieces of furniture. A daily stock position report is prepared as an automatic by-product of posting the requirements records. Also as a by-

COVER REPORT (In Yards) April 6

COVER NUMBER	SALES TO DATE	RECEIPTS TO DATE	POSITION	ON ORDER (PIECES) TOTAL	ON ORDER (PIECES) IN TRANSIT	INVENTORY	REMARKS
6414.05	1,000	500	500	10	5	400	
6414.06	500	250	250	5		200	
6414.07	400	200	200	4	4	100	
5312.05	1,000	500	500	10	10	300	
6540.11	1,000	1,500	500 CR	10		1,000	STOCK ORDER
	100,000 T	75,000 T	25,000 T			50,000 T	

EXHIBIT 2

product of the tabulation and posting of the orders daily, year-to-date totals of sales are accumulated and shown on the report. The process and the report makes it possible to determine daily the trend in the demand for any cover cloth.

It was found that, in order to use the reported figures as a basis for procurement, it was necessary to be certain of the accuracy of the recording. In order to do this, we had to prove that each posting had been made to the proper pattern-color card. Our system was, therefore, designed to make sure of the accuracy of the recording by incorporating the material code number with the balance in a package proof. We use a six-digit number and, because often only one digit of the number may change from one posting to the next, an error in the selection of the proper ledger card could easily occur. The mathematical control over the code number, combined with a "zero" line proof, gives assurance that the change in the stock position has been accurately recorded against the correct stock item.

To produce complete purchase control and simultaneously perform actual and standard costing for usage, two additional elements were added to the usual inventory control plan. Totals of receipts, by items, for the year to date are accumulated as the receipts are posted to the inventory accounts. The receipts for the year to date are compared with the sales for the year to date in compiling the periodic or weekly report, mentioned below. A daily report is also produced as a by-product of posting materials issued. The exhaust method of posting is used, meaning that all of one grade or pattern-color is posted at a time. Both actual and standard usage is shown, not only for each cover cut but also by grade or pattern-color totals. Excessive usage is quickly and easily

spotted from the grade totals, permitting corrective action to be taken without any delay.

Periodically, usually on a weekly cycle, a detailed report, (Exhibit 2) is mechanically prepared in triplicate from the cover cloth material ledger. One copy goes to the purchasing department for a complete review of our position in this material. A second copy goes to the production control unit for scheduling purposes. The third copy remains in the accounting department for statistical sales analyses and inventory control purposes. This machine-printed report with automatic calculations and totals, is produced with very little special preparation. Fast in preparation and timely in presentation, it shows for each cover number the sales to date, the receipts to date, the current stock position (sales less receipts), the quantity on hand, and the pieces on order.

Prompter Action

By combining and coordinating the paper work of various departments timely reports for the control of costs have become a standard with our company. The illustrations in this article are the typical examples. The use of modern accounting machine methods has cut report processing time to one-third of what it was under manual methods, has supplied increased accuracy, and has given us neat machine-printed records and reports which are easy to read, understand, and hence to act upon.

Daily Balancing of Labor Loads by Work Stations

by RALPH W. KINDLEY

Branch Manager, The Wright Line Inc., Worcester, Massachusetts

How a major assist to the scheduling of productive operations on parts in process can be offered through application of tabulating equipment capabilities is narrated in this article. The procedure followed involves over-all determination of load by stations (operations) and its distribution daily to these stations through process cards sorted to preferential assembly order.

COST ACCOUNTANTS FACE the obligation of becoming cost engineers working in harmony with production management. One of the most critical factors in production management is that of scheduling, i.e., planning release of jobs through the work shop in a manner which will provide production workers at each work station with the proper work load always at hand to make certain of obtaining eight hours' worth of production for eight hours' pay. Moreover this work load must be balanced and must obviate the need of shuffling employees from one work station to another. Each man should work at his skill consistently. It is easy for production planners to fall into the trap of a "feast or famine" type of operation in which for example, shear operators are busy while press operators are idle awaiting shear work and later, while press operators are busy, bench hands are idle awaiting press work, etc. Lowest costs cannot be obtained in an unbalanced condition of this sort.

Staffing the Stations

The cost accountant has tools and know-how available to help with this problem. A hypothetical case will be given here to facilitate explanation of how he can help the production man maintain balanced labor loads. Let us assume a metal fabrication shop composed of four separate work stations in which skilled workers are assigned to handle fabrication of parts for building a product consisting of five thousand individual parts at the rate of 100 products during each fifty-day cycle. The four work stations involved are: Station A—Shearing, Station B—Press, Station C—Metal treatment, Station D—Bench finish.

As soon as production planners are given an operational bill of material defining the product, the scheduling problem looms ominously at hand. This bill of material is the starting point for the accountant's contribution. The bill should tell the accountant the work station at which each operation will be performed and also the standard hours required to perform it. From

CALCULATION OF NUMBER OF EMPLOYEES NEEDED AT STATIONS

Work Station	Total No. of Parts Passing Through	Total Std. Hrs. Required	Daily Requirement of Number of Parts to Pass Through	Daily Requirement of Standard Hours of Production	Number of Production Employees Required
A - Shearing	400,000	10,000	8,000	200	25
B - Press	300,000	50,000	6,000	1,000	125
C - Metal Treatment	100,000	2,000	2,000	40	5
D - Bench Finish	200,000	30,000	4,000	600	75
Overall	500,000	92,000	10,000	1,840	220

EXHIBIT 1

the bill of material, the accountant can extract a summary of operations, by classifying the number of parts scheduled to pass through each work station. Punched card equipment makes this task a relatively simple one. The arithmetical operation of dividing the total number of parts and total standard hours for each work station by fifty days (cycle time established for completion of a set of parts) provides the number of different parts and number of standard hours required daily in order to maintain schedules at each work station. Dividing the standard hours required daily at each work station by eight hours per day provides the number of employees required at each work station to produce parts economically. The above calculations may be summarized hypothetically as in Exhibit 1.

Scheduling Parts for Assembly Sequence and Work Load Balance

This summary has now defined the total work load and given us the limits within which work must be performed to produce economically. We have a target to shoot at. However, to know the limits of quantity and man power is only the basic beginning to the answer of our scheduling problem. Parts must be produced in a logical preferential sequence, i.e., in accordance with assembly requirements to build sub-sub assemblies prior to sub-assemblies prior to final assembly. So it is necessary to set up a production flow which embraces two principal considerations:

1. To fabricate parts in their logical sequence for assembly.
2. To provide balanced work load daily to each work station.

Again let us go back to the bill of material and, through the use of punched cards, arrange the parts in order by preferential manufacturing sequence. We know that, if parts are fabricated in this sequence, assembly requirements will be met. However, giving consideration only to sequence may distort the balanced work load which is mandatory to economical production. Proper scheduling must embrace both considerations. Again punched card equipment can be used

DAILY STATION WORK LOAD BALANCES IN STANDARD HOURS

Part No.	Name	Preferred Sequence	Standard Hour Value Per Station A	B	C	D
	Daily Load Factor		200	1,000	40	600
2042	Bracket	1	2	0	1	1
3210	Clip	2	1	2	0	0
6508	Stringer	3	0	3	0	2
6043	Corner	95	2	3	1	2
5210	Clip	95*	0	1	0	1
8728	Bracket	98	2	0	1	0
3541	Angle	101*	0	0	0	3
			0 CR	0 CR	0 CR	0 CR

*Note that the consecutive sequence preferred is broken between 95 and 97 and also between 98 and 101. This indicates that three part numbers with assigned sequences of 96, 99 and 100 respectively have been delayed in schedule in order to balance the work load. The situation for one day out of the fifty-day cycle is not disturbing when considering the advantages of balancing the work load.

EXHIBIT 2

to minimize the clerical effort involved to analyze the effect of sequence upon balanced work loads. From our summary of the total work load in parts and standard hours for each work station, we know the daily requirements of production to meet schedule. An accounting machine can be controlled, as described below, to select the parts which should be scheduled for production each day while giving consideration to the preferred manufacturing sequence.

Our summary tells us that the daily load in standard hours for each work station is as follows:

A—Shearing	— 200 hrs.
B—Press	— 1000 hrs.
C—Metal treatment	— 40 hrs.
D—Bench finish	— 600 hrs.

In order to select the parts for the first day's schedule, the procedure is, first, to read into separate counters of the accounting machine this daily load in standard hours for each work station. As the cards which represent the bill of material (in order by preferred manufacturing sequence) pass through the accounting machine following the load factor card, the machine will progressively subtract the standard hour value of each part from the daily load factor until a negative balance is reached for any of the work stations. This negative balance indicates that the scheduled work load for the day has been satisfied for the particular work station whose balance has become negative. Further, as subsequent

DAILY COMPARISON OF ACTUAL VS. SCHEDULED PRODUCTION

(All Figures Are Presented In Std. Hours on a Cumulative Basis)

STATION	DAYS IN CYCLE	1	2	3	4	5	6
Shearing	Scheduled	200	400	600	800	1,000	1,200
	Actual	180	390	580	790	1,020	1,230
	% Efficiency	90	97	97	99	102	102
Press	Scheduled	1,000	2,000	3,000	4,000	5,000	6,000
	Actual	1,200	2,000	2,400	3,000	3,500	4,200
	% Efficiency	120	100	80	75	75	70
Metal Treatment	Scheduled	40	80	120	160	200	240
	Actual	20	50	100	150	200	250
	% Efficiency	50	62	83	94	100	104
Bench Finish	Scheduled	600	1,200	1,800	2,400	3,000	3,600
	Actual	360	1,080	1,800	2,400	3,600	4,000
	% Efficiency	60	90	100	100	120	111
Overall	Scheduled	1,840	3,680	5,520	7,360	9,200	11,040
	Actual	1,760	3,520	4,880	6,340	8,320	9,680
	% Efficiency	96	96	88	86	90	88

EXHIBIT 3

cards feed through the machine following recognition of a negative balance in any station, the machine is controlled to eliminate the selection of any further card with a value for the station having a negative balance. By this elimination, the machine recognizes the parts which must be delayed a day or so in schedule, in order to balance the work load for all stations.

The printed report produced from the above can be made to appear as in Exhibit 2. It is significant to note that, when preparing the parts list for the second day's schedule, the parts delayed on the first day will appear first on the schedule, inasmuch as they now have the lowest preferred sequence assigned numbers. When all parts for the fifty-day cycle have been selected as above, production management can issue work orders to the fabrication shop, confident that this master plan, if followed, will result in an economical operation.

Keeping the Work Stations on Schedule

To maintain schedule, the problem now becomes one of comparison of results with the master plan to determine that production at each work station is on time. A serious bottleneck can occur if any one of the stations falls behind schedule, because each depends upon receiving its quota of parts from the other stations. To

measure the results is quite simple. Production counts are secured from each work station daily. Standard values for each work station are multiplied by the pieces produced for each part number. Totals are tabulated for the value of all parts passing through each work station. When these totals are set alongside scheduled hours for each station on a cumulative basis, a percentage of efficiency may be readily computed. A daily report, as illustrated in Exhibit 3, will quickly highlight work stations which are in trouble of any kind. It is apparent from the figures on the report for the sixth working day that the press work station is having difficulty. Corrective measures must be taken in this area.

This article has presented an application of one of many methods which the cost accountant can bring to bear to help the production man solve his problems. There are many other ways possible but the accountant must climb out from behind his desk long enough to become familiar with productive operations. The field is fertile. The results are gratifying. However, there is one caution. Do not look for pat answers out of text books. The answers are in practice not theory.

Organizing Timekeeping for Reliability

by JAMES B. GEORGE

Manager of Cost Accounting, Link Aviation Inc., Hillcrest, Binghamton, New York

A succinct restatement of the significant place which timekeeping occupies at the base of the cost information structure, whether in large shops or small ones, is given in the course of this article, which also condenses the timekeeping procedure followed by one company in securing overall and detailed accuracy.

THE TIMEKEEPERS FORM one of the most important groups in the operation of controls and control reporting. For that reason, the timekeeping unit should report to the controller, thus protecting its independence and freedom to report the facts as they exist. In my experience with job shop operations, the successful operation of the timekeeping functions requires proper organization and a clear and suitable method of operation. These two elements will be considered in this paper.

Organization of the Timekeeping Function

The timekeeping organization is properly headed by a chief timekeeper reporting to the assistant controller or equivalent. The timekeepers at production stations, plus one or more roving timekeepers should report to chief timekeeper, who should be a

man with shop background and some understanding of production, planning, scheduling and general manufacturing operations. He must also have a general understanding of factory accounting, in order to recognize the impact of his decisions on financial and operating statements. It should be among his duties to hire, train, and coordinate the activities of the timekeepers. He should be responsible for working with factory supervision and settling questions which arise in the operation of timekeeping. An important part of his job is to continuously "sell" the foremen and assistant foremen on the need for and value of accurate time recording. He is properly responsible also for the preparation of labor distribution journals and the labor correction journals, if maintained.

Timekeepers should be mathematically alert individuals interested in learning shop operations. They should understand the operations of the department to which they are assigned. Their day-to-day functions are to record direct and indirect time accurately and, in departments in which it is feasible to clock the employees on and off jobs. They are responsible for the accuracy of job and operation time charges. The roving timekeeper is essentially a checker and should have been a successful timekeeper in several departments, with a broad general knowledge of the factory operations. His job is to go from department to department making floor checks of work in operation and comparing it with the charges as submitted by the timekeepers, as well as to assist in a weekly audit of time charges.

Operation of the Timekeeping Function

There are three major steps in the operation of the timekeeping department. These are authorization of time charges, maintenance of work flow, and audit of time charges.

As to the first, the timekeeping organization is responsible for the charging of all labor in the company, direct and indirect. It is the responsibility of the chief timekeeper to make certain that the coding (which underlies the cost records and the overhead reports) is correct. In general, the labor will fall into three classes, i.e., direct factory labor, indirect factory labor, and office labor. For direct factory labor, work orders should be available showing the master job number and, as released by the production department, should have predetermined codes. However, it is the responsibility of the timekeepers to call to the chief timekeeper's attention any work orders which appear questionable as to coding. The final decisions on time charging should come from him. For all time of factory personnel not expended on a customer's order the timekeepers must prepare time distribution cards and decide upon the charge in the initial instance. If the foreman disputes a timekeeper's charge, the disagreement should go to the

chief timekeeper or assistant controller for reconciling the difference of opinion. This will make it almost impossible for a foreman to cover up a bad job by charging it to an obscure cost category. Time distribution cards are also prepared for all other personnel. Even though some of these people prepare their own time distribution cards, this does not relieve the timekeeping unit of the responsibility for the accuracy of the related job charges.

In order to expedite work flow, the second step in the timekeeping operation, and to permit fast reports on our time charges, we use punched cards for time recording. Mark sensing is used, to a great degree, in connection with these. The steps of time charging are as follows. On all factory work, the work orders are presented to the timekeepers at the time the job is started and at the time of completion of a job. The timekeeper rings a time distribution card and records pertinent information on the card. At the close of the week, time distribution cards are closed out and sent to the tabulating department regardless of whether or not the job is completed. A new card is instituted for the following week. Weekly the timekeeper prepares time distribution cards for indirect labor. After the time distribution cards have been prepared with the required information inserted, they are sent to the tabulating department for key-punching. At this point, attention should be called to the fact that attendance cards are calculated by the payroll department, a group completely independent of the timekeeping unit.

The next step is for the tabulating unit to sort time distribution cards by man number and co-mingle the cards with the attendance cards which show total hours worked. The tabulating department prepares a report which adds the attendance card hours and subtracts the time distribution card hours. If the result is not zero, the time distribution cards are returned to the timekeepers for review and correction. This insures that the time for which we pay has been distributed properly and gives us a control against the possibility of paying for labor hours which we do not receive.

After the time distribution cards are reconciled, they are then run in a weekly card listing by master job number or overhead account and turned back to the chief timekeeper. He then makes an audit of the charges. This report brings together all the charges for a given week on a given contract into one detailed listing and shows all information punched in the job card. As is apparent, the audit of total hours is automatic in the work of the tabulating department. However, the audit of other data on the card is not. Thus, the chief timekeeper uses the weekly run of time distribution cards as a basis for auditing. With the assistance of the roving timekeeper, he reviews these runs for the accuracy of departmental codes and master job number

and overhead classification. Any errors found are then corrected by a supplemental labor journal. It should be noted here that there is built into our system of controls a budget program which would call attention to major variations in overhead time charging and which would also call for an explanation of major variations in charging of direct time.

One of the Foundations of Control

The timekeeping staff is responsible for a major part of our overhead and direct charges. The accuracy it achieves is reflected in the control reports upon which management decisions are made. If the timekeeping function is properly organized and proceeds by suitable methods of operation, it gives strength to control efforts because it is based on:

Independence
Definite assignment of responsibility
Simplified work flow
Trained personnel

Let none underestimate the importance of the timekeeping function for, without correct time distribution, most of our manufacturing control reports lose their value. With correct distribution, decisions based upon our control reports can be made with confidence.

Letters to the Editor

INDUSTRIAL ACCOUNTING INTO MANAGEMENT ACCOUNTING

Editor, N.A.C.A. Bulletin:

EVEN THOUGH ACCOUNTING, especially industrial accounting, has made rapid progress in past years, its full potentiality as a tool for profit-making has not yet been fully realized. There is an amazing diversity of opinion as to the objectives or functions of the industrial accountant, the duties necessary to a complete fulfillment of these objectives, and the place of the industrial accountant in modern management.

Possibly the most important duty of the industrial accountant is that of selling himself and his services to top-management. It is his duty to see that his boss understands the ways in which the accountant can help, for the qualified industrial accountant is in a position which enables him to provide outstanding management service to his employer. All of the financial history of the company, its statistics, and other recorded information are available to him and, in most cases, to him alone. At all events, he alone has the staff and facilities necessary for the preparation of reports, analyses, and other information for top management. Further, his knowledge of tax matters and other governmental regulations enables him to judge their profit impact in connection with transactions of the company.

The next duty of the industrial accountant is education of himself and his assistants. I believe that it is well understood today that education is a continuing process, that it does not end when we graduate from college. Certainly, a sound basic formal education is necessary, but this merely provides a base upon which to build. The ever-changing needs of our economy, the newly developed techniques of industry, the increased demands of government—all these make it imperative to continue education. It is necessary to keep abreast of the changes in tax and commercial laws and in governmental regulations, in order to be in a position to realize the profit impact of such regulations on operations. Education can come still closer. It involves knowing what the finished product looks like, how it is packed, and what the manufacturing processes consist of. Without a sound understanding of the company, its processes, and its products, it is impossible to develop sound industrial accounting.

Beyond self-selling and self-education, the third important duty of the industrial accountant lies in the field of personnel work. For the successful operation of his department, it is necessary that the accountant develop tact and diplomacy. Industrial accounting cannot be a one-man job. Without the help and assistance of other department heads, the supervisory staff, and all personnel in the organization, the accountant cannot operate efficiently.

Another duty of the accountant—and a very important one—is to improve his use of communications and report writing. It is difficult for some people to communicate their ideas to others intelligently, even though they may possess all the other qualifications necessary to their position. As to reports, it must be admitted that most persons in business do not write good reports. It is necessary to learn to condense information and interpret it in a manner which will hold the interest of the reader, considering his needs and the use or uses to which the information will be put. Better report writing will result in increased usefulness of our product, i.e., profit-making ideas for management. While on the sub-

ject of reports, let us not forget the men down the line, the superintendents, the foremen, etc. Rather, let us remember them especially.

Today, business management is faced with innumerable problems. Long-range planning, profit-volume relationships, the impact of tax and other governmental regulations—these and many others take up much of the time of top-management. The industrial accountant, if he is well qualified in all respects, will find that industrial accounting has become management accounting.

HOWARD O. WILLIAMS

TOWARD A DEFINITION OF CONTROL

Editor, N.A.C.A. Bulletin:

IN A RECENT oral examination given to a candidate for a master's degree in industrial engineering, the discussion centered around quality control. The candidate was asked for a definition of control. He replied, "Control constitutes an attempt to influence variables." This short definition should strike a familiar note for accountants who are concerned with the classification of costs into fixed and variable. Although the definition is not complete, it does imply an insight into the problem.

In a broad sense all activities of management to minimize the costs in the maximizing of profit could be described as control activities. However, cost control must ultimately center in individuals. Individuals originate costs. They are at the focal point of cost control, the point of origin. In order for cost control to be effective, the duties and responsibilities of these individuals with respect to originating costs must be prescribed. Further, they must have the authority to act in accordance with the assignment of duties and responsibilities.

The importance of standards in control seems to have general recognition. The standards are assigned to the responsibility of individuals in accordance with the adopted plan. They serve a dual role, i.e., as a measure of the efficiency of individuals and as the basis of determining variances which are to be analyzed. They enable management to have a continuous report of progress of the actual as opposed to the planned results. Inasmuch as standards are essential in judging performance, they are at the very heart of accounting control.

Another element in control is related to the continued directing of operations in accordance with the adopted plan. Accounting reports assist both in detecting variances from the plan as well as in disclosing erroneous features of plans. Corrective action is to be taken to eliminate undesirable variances from the plan as well as to revise unsound plans.

In summary, a definition of control for accounting purposes should make adequate reference to the following elements:

1. Plan of activity for a period.
2. Relationship of individuals to the point of origin of costs.
3. Establishment of standards of performance.
4. Comparison of actual performance to that of the standards and plans.
5. Provision for corrective action to eliminate unfavorable variances and to revise unsound plans.

JAMES S. SCHINDLER

Editor, N.A.C.A. Bulletin:

MUCH HAS BEEN written on REPORT PREPARATION but I wonder whether most of us have first tried to divided the end-product between (1) reference material and (2) useful material.

Obviously, a balance sheet can be properly considered as either, but generally it is just reference material. Obviously, a

budget MUST be catalogued as useful material if it is worthy of its preparation.

My point is the need for each of us to inquire of the reader how he would classify the report within these two groups. When you have done this, you will have taken ONE of the very first steps in solving the problem of communication, the problem of "who . . . says what . . . by what media . . . to whom . . . with what effect."

Only by this means can you eventually minimize the reference data and send out more timely and useful material, as one has just so many working hours in the day and number of available employees, and readers

WESLEY B. EDGAR

Notes on Current Reading

Books

Annals (1953-54) of the National Society for Business Budgeting

James M. Shackelford, Johns-Manville Corp., 22 E. 40th St., New York, 16, N. Y., Paper-bound, 102 pp., $1.50.

Here offered are proceedings of the 1954 conference of the National Society for Business Budgeting, recently provided to N.A.C.A.'s library. All papers included are highly relevant to the budgeting function. The four final addresses relate to planning and to performance analysis, particularly as related to decentralized operations. Earlier papers include one each on the budgeting of advertising, engineering, and research costs. There is also a treatment of "operations research as an aid in planning."

Financial and Administrative Accounting

C. Aubrey Smith and Jim G. Ashburne, McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y., 1955, 493 pp., $7.

Prefaced as directed to the student not intending to make accounting, whether public or industrial, his career but planning a career in other areas of the business (or, more broadly, economic) world, this new text starts with a chapter seeking to "place" accounting in today's industrial setting. A review of the substance of the work suggests that the distinction emphasized is kept in mind throughout, although the ground covered is necessarily much like that of texts directed to prospective accountants.

NOMA's 36th International Conference Proceedings

National Office Management Association, 132 West Chelten Avenue, Philadelphia 44, Pa., 1955, 112 pp., (regular issue of Office Executive, July 1955).

The overlapping areas between the office management and industrial accounting fields are evident in the subject matters of the nine addresses here reproduced, which include the control of office costs, budget development, work measurement, methods improvement, electronic data processing, incentives (financial and psychological), duplicating equipment, and development of executives. The paper on data processing considers factors to be taken into account before purchasing electronic equipment.

Articles

Developing Accounting Practices Among Executives

C. R. Fay, Controller, September 1955.

One of the more thoughtful and perspective-regarding papers on the accounting function and its realization, this article discusses primarily the latter under three principal heads: technique and theory of accounting practices, planning, and control. The author closes on the note, that through processes of co-ordination, evaluation, and interpretation within the company, all executives may be brought closer to the usefulness of the information compiled, channelled, and—above all—communicated by the accountant.

"Clocks" for Management Control

Allen W. Rucker, Harvard Business Review, September-October 1955.

In this provocatively titled article, the author discusses "some applications of the break-even principles which are destined—for wider acceptance—in the years ahead." He has in mind relatively ready answers to questions executives may need answered

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

THE CONTROLLER, *September 1955* (2 Park Avenue, New York 16, N. Y., single copy $.50)

*Developing Accounting Practices Among Executives. C. R. Fay.
Rapid Tax Depreciation Under the 1954 Revenue Code. Willard F. Stanley.
*Reasons for Retention of Earnings. Robert S. Holzman.

COST AND MANAGEMENT, *September 1955* (31 Walnut Street South, Hamilton, Ontario, Canada, single copy $.50)

Marketing Cost Control. Paul Jeffrey.
Developments in Electronic Data Processing Machines. M. J. Fraser.
The Human Relations Aspect of Financial Controls. J. A. McIntyre.

JOURNAL OF ACCOUNTANCY, *October 1955* (270 Madison Avenue, New York 16, N. Y., single copy $.75)

Helping the Small Client With Budget Problems. Thomas W. Leland.

THE NEW YORK CERTIFIED PUBLIC ACCOUNTANT, *September 1955* (677 Fifth Avenue, New York 22, N. Y., single copy $.50)

Punched-Tape Methods—A New Look in Office Procedures. Richard H. Goldberg.
The Percentage-Squared Method of Depreciation. Morton S. Conrad.
*Management Services by Local Practitioners. Joseph L. Brock.
* Further mentioned in accompanying notes.

—one is whether or not a change of emphasis in selling effort is needed—and provides eight reference tables, one of which is headed "pre-tax profit standards for varying levels of operation."

Projecting Capital Needs

Richard M. Rothschild and Paul Kircher. Journal of Accountancy, September 1955.

Whether to call this paper an instance of statistical, operations research or scientific approach (the last-named is the authors' designation) to accounting problems of management, is difficult to decide. At all events, the article exemplifies application of an approach to problem solution through model-building in the construction of a working capital forecast. Use of formulas is avoided and the presentation lives up to one of its closing sentences, which reads, "In most cases the working capital model can be developed quickly and easily."

How to Figure Equipment Replacement

Philip A. Scheuble, Jr., Harvard Business Review, September-October 1955.

Neither a simple nor a short article on its difficult and important subject—industry's multi-million dollar question—this article is quite comprehensive. Representative of a number of facilitating illustrations is one labeled "nomogram relating savings per year, equipment cost, and number of years to pay off an investment plus a given percentage return on investment." The nomogram is utilized in three problem solutions given.

SELECTED ARTICLES FROM BUSINESS PERIODICALS

AMERICAN BUSINESS, *September 1955* (4660 Ravenwood Avenue, Chicago 40, Illinois, single copy $.35)

What Are the Reports Management Really Wants. Herbert O. Brayer.

HARVARD BUSINESS REVIEW, *Sept.-Oct. 1955* (Soldiers Field Station, Boston 63, Massachusetts, single copy $1.50)

Decision Making in the Age of Automation. Melvin L. Hurni.
*"Clocks" for Management Control. Allen W. Rucker.
*How to Figure Equipment Replacement. Philip A. Scheuble, Jr.
Industry Patterns of Executive Compensation. Arch Patton.

SYSTEMS AND PROCEDURES QUARTERLY, *August 1955* (Box 281, Wall Street Station, New York, single copy $1.00)

A Single-Column General Ledger Account Form. Howard C. Greer.
Electronics, Its Possibilities and Limitations. Virgil F. Blank.
*Further mentioned in accompanying notes.

Management Services by Local Practitioners

Joseph L. Brock, New York Certified Public Accountant, September 1955.

At first glance, this article, as in the public accounting field, appears irrelevant to accountants in industry. But what is this about management services? There are given three lists of such services: a thirteen-point list of primary services, a nine-point list of (principally) planning services, and a nine-point list of assorted exceptional services. Because these lists do not read unnaturally, for the most part, if "industrial" is substituted for "public" as the descriptive adjective, two thoughts are suggested: that they make informative reading for all accountants and that the profession of accounting (apart from auditing) is of one sort throughout.

Reasons for Retention of Earnings

Robert S. Holzman, Controller, September, 1955.

Opening with the sentence, "Sooner or later, most cases involving tax on accumulated earnings end up with the question, 'why was surplus retained?'," this paper then supplies, in groups by classifications short summaries of justifications advanced and the court finding for 225 reasons given to tax authorities for such retention. The classifications (indicative of the causes for which earnings retention was thought advisable by the taxpayers) are: affiliates, depression, errors and doubts, expansion, financial factors, hazards, manner of operating, past practice, surplus concepts, and unusual conditions.

Accounting Reform in Washington

John W. McEachren, Journal of Accountancy, September 1955.

Providing a summary review of the course and achievements of the on-going Joint Program to Improve Accounting in the Federal Government, now some seven years old, the author is able to cite concrete economies and other accomplishments of departments and agencies, resulting from applications of management accounting concepts. He states, while acknowledging the "mammoth task" still remaining, that "improvements are being accomplished today which many commercial enterprises could well emulate."

For Your Information

FALL CONFERENCE SEASON

WHEN LAST MAY, For Your Information was devoted to calling attention to topics favored at spring conferences of other associations (with cross reference to Section 2 of the *Bulletin* for N.A.C.A.'s then forthcoming annual conference), it was promised that the late summer and fall season would not be neglected, especially because it includes the annual gatherings of three organizations well-known in the accounting field. Hence, with a reminder that N.A.C.A. regional conference autumn dates will be found prominently displayed in Section 2 of the present issue, these pages are given over to the interest and stimulus which may be found in reviewing the topics which have been found to merit attention at the annual conferences of the American Accounting Association (Aug. 30-Sept. 1), the American Institute of Accountants (Oct. 23-27), and the Controllers Institute (Nov. 7-9), as well as the conferences of several other associations in fields related to accounting.

Emphasis in this discussion is on topics treated, in preference to other features of the conventions dealt with, because it is the subject matter scheduled which perhaps best serves as an indicator in the accounting field generally of current trends in respect of the direction and importance of developments. However, it should be kept in mind, in reflecting upon these topics, that the American Accounting Association has a membership composed largely of teachers of accounting, the American Institute is representative of Certified Public Accountants, and the Controllers Institute limits membership to accounting executives exercising the controllership function in industry, as defined in its membership requirements. These three associations, together with N.A.C.A. (with the largest membership of any accounting organization) and the Institute of Internal Auditors (the May convention of which was mentioned in last spring's writeup in the *Bulletin*) comprise the principal organizations in the field in the United States. It may well be added that several industries—for example, the newspaper, oil, and department store industries—have organizations active in accounting for these specialties and many industries are effectively represented by their trade associations in the promotion of improved accounting.

Overlapping Areas of Interest

Before considering the programs individually, it may be of interest to point out topics which found their way into all three and to note the approaches taken, so far as titles are indicative. Corporate accounting enters the American Accounting Association in an address by a well-known accounting (and other) executive who spoke on "Bench Marks and Beacons" and also in a round-table discussion of "Accounting in the Executive (Training) Program." In the American Institute program, the corresponding subject matter (not the same subject matter) appears in four addresses describing management services which the independent accountant can render. To those present at the Controllers' convention, the topic of "management planning and control" covered overlapping ground.

The accounting activities of governmental units and agencies drew a place on the American Accounting Association program in the opening address and were reflected in the American Institute program in a group of talks on "accounting and auditing

in selected areas of the Federal government." There was a prominent niche for income taxation in all three programs, including an address by the Commissioner of Internal Revenue in each instance. In addition to this feature, the American Accounting Association presented three related talks entitled, "tax equity and the new revenue act," "the new revenue act and the prosperity of the economy," and "the impact of the new revenue act upon accounting." In addition, one of the round-table discussions held concerned "income tax accounting." The American Institute gathering heard a discussion of "the C.P.A.'s place in tax practice" and participated in a panel session on the topic of taxation.

As between the American Accounting Association and the American Institute meetings, another realm of common interest (and differing approach) evidenced in the program was that of education of individuals to meet the requirements of the accounting profession. The former included in its program two addresses on the attraction and selection of, respectively, accounting students and teachers and included much discussion of course content in its various round-table proceedings. The latter offered those in attendance a group of addresses touching on the several responsibilities of colleges, firms and professional societies in "professional development," as well as a general talk on education for the professions.

The topic of electronic accounting equipment was dealt with by both the American Accounting Association and the Controllers Institute meetings. It was in the Association program as a round-table topic. The Controllers heard a principal address on "electronics for business". Its application to accounting in "small enterprises" was the topic of one of the group of "management service" talks at the American Institute gathering.

(In viewing these common interests, it is probable that they should be regarded chiefly in a positive light, i.e., the presence of a topic on a conference program is an indication of high interest and the manner in which it was approached may well indicate a characteristic—or, at least, a tendency —of the group addressed. However, absence of a topic from a program, may not indicate a deficiency of interest in it, except as compared with the topics chosen for attention. It is a fair conclusion that topics actually chosen were, on the whole, preferred to those not treated, with the proviso that attention given a topic in the past could affect the decision to omit it from a program.)

American Accounting Association

As a whole, the program of the American Accounting Association annual convention rested heavily on two topics, the construction of curricula and the attraction of students and teachers to accounting. Of sixteen round-table discussions, held in four successive groups, the majority dealt with course content. Some of the topics were "division of the college curriculum among liberal arts, management and accounting," "the doctoral program for accountants", "the intermediate accounting course," "the auditing course," "bringing the accounting curricula up to date" and "the master's program for the accounting major." As already indicated, two principal addresses bore on teacher and student selection and the former topic was also employed in one of the round-tables.

Teaching methods, too, received attention, largely at the round-tables. "The use of the case method" and "conducting an accounting seminar" are illustrative of this, as is "principles vs. techniques in the first-year accounting course." One topic not cited above and which may be of increasing in-

terest to accountants, occupied those in attendance at the final round-table scheduled, which considered "the teaching of national income accounting."

American Institute of Accountants

It has already been made a point that discussion of management services which a public accountant might render and the education and development of professional accountants were features of the American Institute's conference program and that those present also heard addresses on accounting and auditing in the Federal government and upon Federal income taxation. It may be mentioned additionally that the topic of management services was placed first on the agenda and was particularized into "trends in development of electronic accounting for small enterprises," "the accountant as advisor on budgeting and financial planning", "some essentials of management practices by C.P.A.'s," "rehabilitating a sick business" and "accounting in labor relations."

Three other areas of accounting were given emphatic attention. Five addresses concerned standards of reporting (in financial statements covered by accountants' opinions), two speakers tackled accounting for defense contracts, and two other addresses shed light on "recent developments affecting the C.P.A.'s legal responsibility." On this topic, one speaker urged the benefits of cooperation between "accountants and surety company executives" and the other stressed "the importance of working papers in relation to the C.P.A.'s liability."

Controllers Institute

A number of emphases apparent in material presented at the Controllers Institute gathering have been identified in the preceding paragraphs, principally addresses relating to "management planning and control," "electronics for business," and Federal income taxation. These were by no means all. One of the conferences' general sessions heard an address on "preparation for growth" and another on "the economic scene." After-lunch talks covered "practical psychology in business" and "world trade and world affairs." An evening banquet address dealt with "the future of aircraft." Meanwhile, two hours of each of the first two afternoons of the gathering were devoted to fifteen "industry conferences," each conducted by a chairman and a vice-chairman. Typical of the industry groupings set up for these "conferences" were "banking and investment," "machinery manufacturing," "mining and extractive," and "public utilities."

Other Conferences

This write-up does not attempt to mention the wide-range of business-related groups which have held fall conferences. However, several accounting and nonaccounting meetings warrant a note here. The American Society of Women Accountants and the American Woman's Society of Certified Public Accountants held their joint conference at Richmond, Virginia, from October 20 to 23. The National Association of Bank Auditors and Controllers met at Denver from October 10 to 13. The Association for Computing Machinery gathered at the University of Pennsylvania September 14-16. The Society for Advancement of Management held its fall conference in New York November 3 and 4 on the theme of "measurement of management."

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF THE N.A.C.A. BULLETIN, published monthly at New York, N. Y., for November 1, 1955.

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GEORGE F. WYMAN, Editor

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Certs. filed with New York Co. Clerk
Term Expires March 30, 1957.

Sworn to and subscribed before me this 12th day of September, 1955.